

JPRS-EST-93-035  
12 November 1993



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# ***JPRS Report***

# **Science & Technology**

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***Europe/International  
Economic Competitiveness***

# Science & Technology

## Europe/International

### Economic Competitiveness

JPRS-EST-93-035

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12 November 1993

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## SCIENCE & TECHNOLOGY POLICY

### German Expert on Status, Need for University Research

937WS0602B Duesseldorf *HANDELSBLATT*  
in German 9/10 Jul 93 p 4

[Unsigned article: "Advance in Development Losing Out in Germany"]

[Text] Bonn. In the science and research sectors the German unification process has made the least progress among all the cooperative fields. This was stressed by the president of the German Research Society (DFG), Wolfgang Fruehwald, on Thursday in Bonn.

According to an evaluation of the DFG president, the extra-university research organizations, especially the colleges and universities of the new lands, have the most difficult phase of their restructuring clearly behind them. Strengthened, they can now turn to restructuring their research. This is demonstrated, in particular, by the receipt of grant applications to the research society from the new lands, which this year has already climbed about 20%, after being at about 15% at the beginning of the year. The DFG, meanwhile, is promoting 15 graduate colleges to universities of the new lands and five special research fields.

In the presentation of the annual report, Fruehwald spoke of "possibly the most work-filled year" in the history of the society. On the one hand, the DFG budget with about 1.5 billion DM has never been so high, but on the other hand there is the greatest number of applications for grants to be handled.

The greatest budget in the history of the DFG also is matched by the greatest number of applications to be processed. Between 1990 and 1992 the number of annually processed applications climbed by about 40% from 8,600 to 12,000. With respect to the amounts applied for, there was even a rate of increase by 53%. According to statements of Fruehwald, this means that despite the greatest budget, there is also the lowest approval rate.

The reason for such a great rise in the number of applications is, according to Fruehwald, the lacking basic endowment of the universities. Were this in good order, the finances of the DFG also would be in order, thinks its president. With a rejection rate of almost 60% only "excellent projects" are receiving grants; very good and good projects, however, have had to be turned down, thus showing how threatening the research situation has become at German colleges and universities. "The DFG is the last bastion of university research in Germany," stressed Fruehwald.

In this connection, stressed the DFG president, only those who in times of need invest in basic research and advancement of the younger generation can win out in the future. All the West European countries, Germany included, thereby are losing their decisive competitive advantage, namely the advancing development of their work force. In the list of OECD countries the Federal Republic with respect to expenditures for education and science, measured in gross national product, stands in the third to last place, followed by Spain and Turkey. "The economic position of Germany can only remain flourishing if its

scientific position is maintained," said Fruehwald. Basic research involves a long waiting period, persistence, and sufficient time for a successful outcome to be realized.

Fruehwald warned against "rapid fire research," from which user-ready products would appear in the shortest possible time due to the great amount of money allocated to specific objectives. For Fruehwald, the prospect of rapid fire research can be likened to those scientists who, at the beginning of the 1950's when polio began to spread, advised that iron lungs be technically perfected instead of devoting resources to the goal of developing inoculations in biological basic research.

According to the annual report, among the sums approved by the DFG 35.7% was for research in biology and medicine, 25% was accounted for by the natural sciences, 23.3% was for the engineering sciences, and 15.2% for the arts and social sciences.

### Germany's Krueger Defends Activities of Large Research Institutes

937WS0602A Frankfurt/Main *FRANKFURTER*  
*ALLGEMEINE* in German 8 Jul 93 p 13

[Unsigned article: "Krueger Takes Large Research Organizations Under His Wing. Better Cooperation With Industry Strongly Encouraged. Financial Resources Remain Frozen Until 1995"]

[Text] Bonn. 7 July. Federal Research Minister Paul Krueger has defended the large research organizations against criticism that they are immovable, bureaucratic, and inefficient. However, the CDU politician strongly encouraged the institutes to intensify cooperation with industry and to market their research results "more aggressively." Germany also has owed its basic leadership position in physics and other fields of fundamental research to these organizations, at which a total of 23,000 persons work. The large research organizations (LRO) are among the most important tools for solving long-term problems in the fields of energy, the environment, and health stated Krueger at a joint press conference with the previous chairman of the Work Association of Large Research Organizations (WALRO), Walter Kroell, and his successor since 1 July, Joachim Treusch.

The 13 West German large research organizations active in the field of the physics of elementary particles include, for example, the German Elektron-Synchrotron (Desy) in Hamburg, the German Cancer Research Center in Heidelberg, and the nuclear research centers at Juelich and Karlsruhe. Krueger promised special help for the three organizations for environmental research (in Leipzig and Halle), for molecular medicine (in Berlin-Buch), and for geophysical sciences (in Potsdam) in the new lands. The Research Minister feels that it is necessary that the industrially useful potential of the LRO be transformed better and more rapidly into marketable products. This must be achieved "with a still greater imagination." New forms of cooperation between industry and the LRO, perhaps joint projects, are necessary. Treusch, chairman of the board of the Juelich research center, conceded that collaboration with industry involves its difficulties. The tone, however, has become friendlier. The enterprises have complained that the new products and methods from the institutes have not been



developed to their usefulness point and, in many cases, they shy away from expending their money for these products and methods. The two sides must get together with one another. At the beginning of September, in a conversation between the WALRO and the Federal Association of German Industry, an attempt will be made to make the division of labor more precisely. In that way, a basis should be laid for discussions of joint undertakings in the future.

Kroell sees a justification for the existence of the LRO in the fact that they perform tasks which require a "great expenditure" and which can be dealt with increasingly only with European or global cooperation in, for example, space. To a greater degree than the universities and other institutes, the LRO provide expert advice for outsiders. Their management is more efficient than that of the colleges and universities. As Treusch sees it, the interdisciplinary work, perhaps of environmental and energy researchers, is better realized in the LRO than elsewhere. The structure of the LRO, which with a yearly 2.6 billion DM will be financed 90% from the research budget, is not questioned by Krueger. He also spoke out against radical cutbacks or closings of institutes because of financial need. Krueger, however, made it clear that the LRO, at the earliest in 1996, can count on higher public allocations. Until then, the sums remain frozen at the height of the year 1992. This means, according to statements of Kroell, a reduction of 2,000 jobs and a real contraction of the research capacity by more than 15%. Scientists feel that these contractions are wrong and senseless. Treusch, however, expressed himself as confident that "massive damage for research" can be avoided.

The maintenance of the position of Germany, the strengthening of research in the new lands and an improvement in the chances of the scientific younger generation have been previously mentioned by Krueger as key points in his work. The conversations on the package of economy measures research, whose sums for 1994 and 1995 will be frozen at 9.466 billion DM, "still came off pretty easy." There will be no reduction of funds for the new lands. Krueger is in negotiations with the Economy Minister and the trust institutions with the goal of formulating a new program for advancing product innovation in East Germany. He hopes to receive financing for this from the EG structure funds.

Krueger made clear that nuclear energy is necessary. Risks must be taken into account, like the disadvantages of fossil fuels. Krueger warned of a disruption in continuity. The prerequisites for a further rise in nuclear energy must not be lost in a few years. In Krueger's opinion, the cost estimates for the magnetic suspended railway do not justify that this new technology not be introduced. He expects that by the end of September economic proposals will be made for a higher financial involvement.

### **East German Industry Researchers Seek EC Funds**

93WS0718C Duesseldorf *HANDELSBLATT* in German  
23 Sep 93 p 16

[Article by Silvia Schattenfroh]

[Text] In recent weeks, politicians of all parties have been demanding new efforts for improvement of industrial research. The realization is common that in wage-intensive "Location Germany", economic growth cannot be achieved

without science and marketable products are not produced without research, even in television talk shows. The eastern part of Germany is primarily, but not solely, at issue. After liquidation of unprofitable industrial operations in the new Laender, scarcely 24,000 of the once 75,000 jobs for scientists remain in the GDR's economy. Companies which had to downsize have—shortsightedly—dismissed their researchers first.

### **Research Fights for Money from Brussels**

#### **A Solid Million From the EC Billions for the New Laender?**

While in the new Laender government-financed, basic research has reached the density of that in the old Laender, industrial research lacks a base owing to a shortage of businesses. Consequently, only 2.5 percent of all German technology-intensive exports come from the new Laender. The question thus arises, said Federal Research Minister Krueger recently in Berlin, whether it is not high time for the government to support innovation in every link of the chain, from basic to applied research all the way to product development and marketing, although this has always been regarded as the responsibility of business.

Meanwhile, the SPD calls for a "concerted action" of science and business, and the CDU/CSU Bundestag group demands "initiatives for strengthening technical development" from the Federal government. The government, in turn, admonishes business to invest more heavily in research. Industry objects that in Germany—unlike other places—providing tax breaks for willingness to engage in innovation has been neglected up to now.

In this situation, an inherent shortcoming appears to be advantageous. The European Community assesses the economic power of the new Federal Laender as pathetic. From 1994 on, East Germany will thus be considered as a development area of greatest urgency, comparable to the need of, for instance, Portugal. The new classification means that from 1994 on, markedly more funds will flow into Germany's eastern region by way of the European Community's Regional Fund. A total of 14 billion ECU, about 28 billion German Marks, can be expected for the next five years.

Previously, distribution of these funds was the responsibility of the Federal Ministry for Economic Affairs, which used them to improve regional economic structures. The EC Commission, however, insists on using a portion of the funds for research and development. The Federal Research Ministry is now taking up this demand, and the science ministers of the new Laender are declaring their interest in involvement. At least 200 million marks per year are to be set aside for research and development. But unlike before, the money is not to be divided with a watering can among the municipalities by the economics ministries, because often in the past they could do little with it for lack of infrastructure. There were said to be municipalities which invested EC funds at the bank as fixed-term deposits.

The research funds are therefore to be used specifically at the "interfaces between science and business." Locations with technology parks or start-up centers are suitable for investment, as are university institutes or other research establishments which already yield scientific achievements and from which accelerated "research transfer" to small

and medium-sized industry can be expected. The Laender have clear ideas of what they propose to support in this fashion and have communicated this to the Federal Research Ministry.

The Research Ministry and the economics ministries of the Laender are agreed that the European Community's research millions must be put into a separate national program managed jointly by the Federal Government and the Laender. Only in this way can something be achieved with it, they say. The Land of Saxony has made itself spokesman on the subject. Its Minister, President Biedenkopf, together with the other Land leaders from the East as well as the Federal Research Minister, will therefore fight for it at the office of the Federal Chancellor this Thursday in Bonn.

The Federal Ministry for Economic Affairs and the Federal Ministry of Finance will oppose it. Both fear that if research can serve itself from the EC pot, it will only awaken the greediness of other departments, for instance the Ministries of Construction or the Environment. How serious public policy actually is about research support will thus become apparent. The Federal Chancellor has given his word that he has made research support in the East a matter of top priority.

#### **Germany: SPD Calls for Higher Research Budget, Cuts in Space Spending**

93WS0718A Duesseldorf *HANDELSBLATT* in German 23 Sep 93 p 9

[Text] The SPD has called for an increase of at least 410 million German marks [DM] in 1994's DM9.46 billion research budget in order to continue performing important functions for protection of industry's position and for future needs research. Its research policy spokesman, Josef Vosen, made this clear yesterday at the start of budget talks in the Bundestag's research committee.

#### **RESEARCH/Social Democrats for Better Support of High Technology.**

His parliamentary group—as well as the government coalition—considers planned spending to be too low and proposes raising the budgetary estimate, explained Vosen. In a countermove, he supported cuts in the German contribution for the European Space Agency ESA. Further internationalization and review of all programs for their practical applications are urgent.

That same day, Federal Research Minister Paul Krueger (CDU), in an interview with the "Sueddeutsche Zeitung," reaffirmed his intention to achieve a DM120 million reduction in the German contribution to the ESA. On the other hand, research policy makers from the CDU and CSU had supported the view that a further cut in Bonn's funding for space flight—already trimmed to DM1.172 billion for next year—practically leads to a withdrawal from the European projects.

According to Vosen, the SPD wants to improve funding by DM190 million for state-of-the-art technologies such as manufacturing, information, and microsystems engineering as well as renewable energy, materials research, and biotechnology. Funding for future needs research must increase by DM170 million.

Support of projects in the new Laender intended by Bonn—DM750 million are earmarked—must be significantly increased. Research on the subject of nuclear technology's "abandoned waste sites" should, on the other hand, no longer be financed by the Federal Government, but rather by industry. The SPD wants to obtain a ban on the relevant budgetary funds. They want exceptions for the removal of hazardous waste sites from the Juelich and Karlsruhe research centers, where the amount of funding must be increased by DM15 million each.

Also on Krueger's agenda that day was the first meeting of the "strategy circle," summoned by him, to which he invited seven top representatives each from industry, labor unions, and science. According to Ministry statements, this committee is to become the "central element of a broadly structured dialogue between science, industry and policy makers on technology policy." Among those accepting were Edzard Reuter (Daimler Benz), Lothar Spaeth (Jenoptik), and Hermann Rappe, head of IG Chemie, Papier, Keramik.

#### **Finland: Plans to Create Central Government Research Organization**

93WS0723A Helsinki *HELSINGIN SANOMAT* in Finnish 31 Aug 93 p B7

[Article by Heikki Arola: "Kaariainen Wants to Reorganize VTT This Fall; 36 Laboratories to Be Replaced by Nine Research Units"]

[Text] Trade and Industry Minister Seppo Kaariainen (Center Party) has promised his support for reorganizing the State Technical Research Center (VTT) this fall. The reorganization will be implemented on the basis of the recommendations made by a committee that submitted its interim report on Monday.

Kaariainen said that he agreed with the committee's recommendations. According to the committee, the VTT has to become more market-minded and get closer to clients. The committee's proposal almost exactly reiterates a study published in June commissioned by the ministry and conducted by professors Sigvard Tomner of Sweden and Walter Zegveld of the Netherlands.

Last spring the professors interviewed VTT clients, primarily businesses, and noted that they were in part dissatisfied. The purpose of the study was to assess the VTT's ability to meet the needs of industry and research. The scientific level of its research was not assessed.

#### **Closer to Industry**

Both the professors and the committee that has just submitted its interim report feel that relations between the VTT and industry should be made closer. They recommend to the VTT a strategy by means of which it would make an effort to obtain more long-term commissions from industry than before.

The members of the committee propose a new administrative structure for the institute to implement the strategy. The present internal management will be replaced by a board of directors composed of outsiders on which there will be two representatives of industry, a representative of the

ministry, another member representing institute clients, the managing director of the VTT, and a representative of the VTT staff.

The restructured board of directors would exercise supreme power. It would determine the VTT's strategic goals and decide on the allocation of funds received by the VTT directly from the budget. The board would decide on the establishment and termination of research units and on their areas of activity. It would appoint research unit advisory committees, the chief director, the research directors, and the administrative director and it would render advisory opinions on research professors' posts.

The VTT's present executive committee would be discontinued, but the participation of interest groups in VTT activities would be handled by setting up advisory committees for each research unit.

#### Nine Units

They intend to thoroughly reform the organization of VTT activities. The top management will be lightened and the executive team will include the managing director, the chief director, and the administrative director, who will be assisted by a "reduced staff."

The research will be distributed among the nine research units, based on both common fields of technology and common groups of clients. Thus the present model consisting of five departments and 34 laboratories will be abandoned.

The executive team and the unit directors will meet in joint sessions.

The VTT has announced that it had already drafted its own plan for internal changes in accordance with the professors' report in July and that it had begun to implement the plan in August. According to the VTT, they intend to complete the implementation of the changes by the beginning of next year.

The committee that submitted the interim report wants to lay emphasis on the independent status of the research units in the restructured institute. There must be an unambiguous division of labor between the executive team and the research directors.

The committee is expediting the selection of the appropriate temporary personnel for the preparation of the new research units. They expect to fill research director posts later through an open search procedure.

#### Nordic Countries' Biggest Institute

At the present time the VTT is the biggest research institute in the Nordic countries, employing more than 2,600 people.

The impact of the reorganization on the number of employees is not yet known. The staff will, however, be reduced, although actual dismissals will not be effected. According to the VTT, only those posts absolutely necessary for operations will be occupied.

The total VTT budget will be about 900 million markkaa this year, a third of which will come from the national budget. Another third will also come from public funds,

from TEKES [Technology Development Center] and the state administration. About a third of it will come from private enterprise.

It has been 20 years since the VTT's last big organizational restructuring.

#### French Minister of Research to Hold National Forum on S&T Research

93WS0730B Paris LE MONDE in French 12-13 Sep 93 p 10

[Article by J-F. A. [expansion not given]: "Broad National Forum on Scientific Research to Be Held", Subhead: "Preparatory to Parliamentary Debate Next Spring"]

[Text] On Thursday, 9 September, Francois Fillon, minister for higher education and research, spelled out the schedule for the broad national forum that he wants to organize on scientific research in cooperation with all the major players in that field of activities. The forum, that is supposed to get underway on 14 September, was announced back in mid-May by the minister and it is intended to be a counterpart to the national S&T roundtable discussion organized by Jean-Pierre Chevenement in January 1982.

Its objectives are: to lay down the broad S&T policy guidelines for the upcoming years; to raise the question of educators' and researchers' mobility and career development; to define research organizations' role and development.

In this context, the minister ordered a panel of experts to be set up and tasked with drafting a guideline report to be submitted to him no later than 29 October. He asked the academy of sciences of the College du France and the parliamentary department for the assessment of technological options for their opinion on these subjects by January 1994. Meantime, from 9 November to 17 December, representatives of research organizations, universities, professional organizations (National Council of French Employers [CNPF], trade unions) and representative institutions or associations will be consulted so that after being synthesized, the final guideline report will be on the minister's desk on 14 January 1994.

Only after that will consideration be given to the possible organization of regional forums and a national colloquium on the basis of which the government would decide its policy on research and in April 1994, undertake discussion of the subject in Parliament. Just so as not to dishearten the well intentioned and nip this initiative in the bud, Francois Fillon is endeavoring to be upbeat about the future of French research by assuring that it will remain one of the government's priorities in the upcoming budget. He asserts that its funding should, theoretically, grow at a quicker rate than that of the government's rate of expenditure and should give greater importance to medical research (AIDS, genome), aeronautics, the environment, and upgrading of research via the National Agency for the Upgrading of Research [ANVAR]. But austerity has its obligations and if, as they say, the funding payments will be by appointment, approval of programs that shape the future, in turn, will be scarce.



### German Research Minister Creates R&D Strategy Group

93WS0712B Frankfurt/Main FRANKFURTER  
ALLGEMEINE in German 6 Sep 93 p 13

[Article by "Stauu." under the rubric "Economy": "A Strategy Group for Technology Policy. Research Minister's Call/Business and Science Must Concentrate Their Energies"]

[Text] Bonn, 5 Sep—The federal government wants to intensify the dialogue between high-ranking representatives of business, science, and government concerning research and technology policy. This plan is part of the set of measures for safeguarding the base Germany that was decided on by the cabinet last week. It is to be put into effect at once. Federal Research Minister Paul Krauuger (CDU [Christian Democratic Union]) has convened a "Research and Technology Strategy Group" toward this end. It is to be composed of seven representatives each from science and research. It will meet for the first time on September 22.

It is Krauuger's idea that the "strategic dialogue" is to concern itself with long-range development and to develop visions for Germany's technology future. The goals agreed on are to be pursued jointly by concentrating the energies of science, business, and politics. Krauuger repeatedly held up as an example the Japanese systematic strategic course of action with respect to new technologies. It is true that there are in Germany numerous discussion groups between science, business and politics, he says. However, these have had no practical results, though the need for action in the field of microelectronics, for example, has been recognized for a long time.

The current rounds of talks with science and business, in part in modified form, are to be continued beneath the strategy group. Referred to here are the "Petersberg Group" for microelectronics, the "Laser Dialogue" rounds of talks with the chemicals industry, and a group for "Manufacturing Technology of the 21st Century." The Research Ministry is not looking at any non-committal consultation rounds in this respect. The participants had to take on commitments. For example, industry has agreed to rate government research facilities for applied computer science. And one company is responsible for each laser research project.

Krauuger borrowed the idea of the strategy group from his predecessor in the post, Matthias Wissmann. But Krauuger made changes vis-a-vis the discussion group's personnel makeup envisaged by Wissmann. For instance, he has now appointed representatives from the new states also. Science is represented in the strategy group by Gottfried Geller of Leipzig University; Gerhard Maess (Rostock University); the former president of the German Society for the Advancement of Scientific Research (DFG), Hubert Markl; the head of the Frankfurt Max Planck Institute for Biophysics, Hartmut Michel; the head of the Fraunhofer Institute for Production Facilities and Design in Berlin, Gauunter Spur; the head of Munich University's Gene Center, Ernst-Ludwig Winnacker; as well as Jauurgen Mittelstrass of Konstanz University as representative of the liberal arts. Business is represented by Eberhard Aurich, managing partner of the Aurich GmbH [Limited Liability

Company] mechanical engineering company in Limbach-Oberfrohne; Berthold Leibinger, managing partner of Trumpf GmbH in Ditzingen; Heinrich von Pierer, chief executive officer of Siemens AG [German Stock Corporation]; and Hermann Rappe, chairman of IG Chemie-Papier-Keramik [Chemicals, Paper and Ceramics]. Also members of the group are the chief executive officers of Daimler-Benz AG and Bayer AG, Edzard Reuter and Manfred Schneider; as well as Baden-Wuerttemberg ex-Minister-President Lothar Spauath; and management chairman of Jenoptik, Carl Zeiss Jena GmbH.

### FRG Official Calls for Increased Support of Environmental Technology

93WS0703C Duesseldorf HANDELSBLATT in German  
9 Sep 93 p 4

[Article: "Increased Support for Environmental Technologies". Subheadline: "Baden-Wuerttemberg Economic Ministry Views Bottom Not Hit Yet"]

[Text] Stuttgart—Baden-Wuerttemberg economic minister, Dieter Spoeri (Social-Democratic Party of Germany [SPD]) has a fistful of specific projects and wants increased government support for the "future environmental technology market." Following a meeting on the community initiative on policy and economy initiated by him, the SPD minister stated: "Besides crisis management, more emphasis has to be given to sectors where new jobs can emerge."

The SPD politician does not consider things to have bottomed out yet, at least in Baden-Wuerttemberg, despite the latest economic data. Therefore his house yesterday also dropped interest rates on support programs from 5.75 to 5 percent in the program for business start-ups and from 5.5 to 5 percent in the environmental support sector. Spoeri pointed out that over the past year the regional credit bank provided reduced-interest loans in the amount of DM716 million. Despite a tight budget, the support volume within his purview for new environmental technologies alone increased by 80 percent to DM235 million since 1991.

In the future, over and above such general support, Spoeri wants to provide government assistance for pilot projects in the areas of recycling and rational energy use as well as the introduction of new products, such as solar technology, onto the market. The fields would be demarcated through dialogs with the firms. He emphasized the "remarkable dynamism of the environmental market," after the summit meeting, in which representatives from IG Metall and business associations participated. According to the estimates of experts, the value of manufactured goods could double throughout the country to DM100 billion by the year 2000. Internationally, if by the end of the decade market volume climbs to a DM1 billion mark, Spoeri considers as realistic the creation of 800,000 additional jobs in the Federal Republic.

However, this would presuppose a steady growth in international markets. Industry representatives agreed with the minister that "research and development in the area of engineering for environmental protection have to be intensified" to "maintain technological competitiveness." Like the industry representatives, the SPD politician also sees new sales possibilities if environmental standards in Europe would be elevated to Germany's

level. Spoeri emphasizes, "on environmental and competitive policy grounds, isolated solutions in the legislation are unacceptable." In the paper that was adopted, it was indicated that such harmonization should ensure that German firms do not deploy into the rest of Europe practicing "environmental dumping."

### Special Program for Eastern German Research Urged

93WS0703D Duesseldorf *HANDELSBLATT* in German 14 Sep 93 p 7

[Article: "Eastern German Research Requires Special Federal Program". Subheadline: "Focus: Berlin's Education Senator Manfred Erhardt Calls for Immediate Impetus"]

[Text] Duesseldorf, 13 Sep (*HANDELSBLATT*)—Berlin's education senator, Dr. Manfred Erhardt (Christian Democratic Union [CDU]) has called upon the federal economic minister and the federal research minister to establish an "industrial research support program" to give a fresh boost to stalled industrial research in Eastern Germany.

In an interview with *HANDELSBLATT*, Erhardt affirmed, "Especially in the new states, Germany's economic focus requires an industrial counterpart to university and extra-university research." In a position paper the Berlin CDU politician develops his concepts on the debate over where to focus research:

- The education politician advocates focusing the education and research system more intensely than hitherto on the identification and targeted support of top talent and peak performance.
- In principle, only after assessment of the research plan, on the basis of performance criteria, for a specific period of time, and tied to regular internal and external evaluation, should support resources be awarded.
- If, indeed, institutional grants cannot be increased, contributions to the German Research Community [DFG] should be distinctly intensified to enable the establishment of additional research centers, special research sectors, graduate school courses, researcher groups and interdisciplinary research associations. This applies also to the establishment of new Max-Planck Institutes in the new states, including Berlin.
- In a concerted action, government, business and the universities could stimulate strategically important technologies and "explore" growth fields and research alliances for specific periods of time.
- Solicitation of third-party resources that rose from DM629.6 billion to DM3 billion between 1970 and 1990, should be even more intensively underpinned with booster and bridge financing and strongly encouraged through other incentive systems.
- Cooperative relations between universities and extra-university research institutions should be enhanced by the joint appointment of leading scientists, joint research projects, joint responsibility for diploma and doctorate candidate students.
- Newly established extra-university research institutes in the new states have to be propped up over the next five years with a "special investment program" for

urgent construction, rehabilitation and equipment investments amounting to DM700 million.

- It is necessary to improve applied research and development in the colleges, above all with a view to cooperation with medium-size companies. This applies particularly to the new states of the Federal Republic.
- Erhardt also is encouraging a program for a reciprocal exchange, for a specific period of time, of scientists from the universities and from the business world.
- The academic world and every individual scientist have to make an effort to get greater public awareness of their activity and to gain social recognition.
- A high-level working-group should be set up under the DFG to surface legal regulations and administrative red tape that hamper research as well as attitudes hostile to science and prevailing anti-technology moods. In this context the CDU politician can conjure up something like an "institute for assessing legal, bureaucratic and ideological consequences."

### New Regional AI Research Center

Paris *PRODUCTIQUE/AFFAIRES* 20 Sep 93  
in French 93 pp 3, 4

[Unsigned article: "INRIA Strengthens its Presence in Lorraine"]

[Text] The National Institute for Computer and Automation Research (INRIA), presided over by Alain Bensoussan, is extending its regional presence in Lorraine with the establishment of the LORIA research center in Nancy, in association with CNRS and the Nancy universities. Already established in Rocquencourt (1967), Rennes (1979), Sophia Antipolis (1983), Nancy (1987), and Grenoble (April 1993), the institute is reaffirming its policy of regional implantation. INRIA Lorraine, headed by Patrick Rambert, includes 110 scientists (28 from INRIA, 19 from CNRS, and 60 academics), 110 graduate students, and 50 engineers, technicians, and administrators. The LORIA research center, with an area of 8,000 square meters in the Nancy Brabois industrial center, was implemented with help from the Ministry of Land Resources Management, regional groups (Lorraine region, Nancy district, and the General Council), as well as from CNRS and the Ministry of Higher Learning and Research (University of Nancy I). The center re-groups the computer research services and teams from INRIA Lorraine and from CRIN (Nancy Computer Research Center). The Lorraine unit is currently developing nine projects mainly focusing on the following: system and program tests; software—artificial intelligence, man-machine communication, and vision—digital modeling, automation, and production. Total staffing at INRIA Lorraine went from 75 in 1986 to 260 in 1993. Thanks to a policy of close involvement with regional laboratories associated with INRIA, the Lorraine unit contributed to recruiting a high proportion of scientists. Its development has allowed the creation of 53 jobs in five years. Analysis of the INRIA Lorraine budget (other than personnel and buildings), also reflects the strong growth of the research unit, going from 5.7 MF in 1988 to 16.7 MF in 1993. Eight of the nine research projects at INRIA Lorraine are collaborative projects with Lorraine university laboratories associated with CNRS: the computer research center at Nancy

(CRIN), the Elie Cartan Institute at the University of Nancy I, and the Mathematical Methods Laboratory for Systems Analysis (MMAS) at the University of Metz.

### **EC Commission Official Interviewed on US S&T Policy**

*94WS0003A Paris EURODIAGNOSTIC in English  
Jun/Jul 93 p 16*

[Interview with Riccardo Perissich, Director General of the DG III (Domestic market and industrial affairs) by Bernard Volker: "Civilian Research, A Top Priority"]

[Text] Bernard Volker: Don't you think that Clinton, the new American president is adopting an interventionist policy in the area of research?

Riccardo Perissich: The signs coming from the United States certainly do suggest that. We have to see what will be left of Clinton's rather more involved approach after it has been through Congress. But if I have understood the intentions of the new administration correctly there is one central element that is important and that is giving research priority to civilian industries and not to the military. One of the major characteristics of US research policy, compared to that of Japan which is at the other extreme, is its concentration on military research. This is what is changing so dramatically right now. There is a move in investments from the military to the civilian.

There is something else that we must consider and that is whether Clinton will confirm another new trend that had been announced, namely stressing competition more than pre-competition. Quite a lot of what has been said and written suggests that this is happening and American industry seems to believe it too. But we must wait and see what happens.

Volker: Do you think that this could affect what we are doing in Europe?

Riccardo Perissich: European research has always tended to tilt less towards the military and that is true not only for European research programmes by definition but also universally—government activity has also generally tended not to be obsessed with the military infrastructure.

It should also be noted that Europe has generally tended to be less "ideological" than the United States which has often refused to move closer to the market itself. But things have changed and indeed the situation has varied from one country to another so it's difficult to generalise.

I don't think that this will create a revolution in Europe but it does add strength to the arguments of those who believe it's important to move closer to the markets.

Volker: What do you think of President Clinton's idea of "information highways?"

Riccardo Perissich: It is very similar to the concept of trans-European networks. It's exactly the same principle and the same idea as providing the system, or the country, or in the case of Europe, the Community, and even beyond the Community, when we think of the countries of Eastern Europe, with a far more exhaustive and modern computerised infrastructure than today.

Volker: This is going to take a lot of money.

Riccardo Perissich: Yes it will, but the decisions made at Edinburgh took this into account and quite large sums of money have been earmarked for these networks. It is important to understand that in terms of public money, telecommunications and computer networks are to a large extent those which can be financed by the private sector.

Volker: And what if the United States does succeed in developing these research programmes with government support and subsidies? Could this present problems for the GATT negotiations?

Riccardo Perissich: We must wait and see. Within the GATT there is a code of subsidies which is under discussion at the moment and which also includes guidelines for research funding. We must first wait and see what Congress will allow Clinton to do.

### **EC: Fourth Framework Program Budget, Focus Reviewed**

*94WS0003B Paris EURODIAGNOSTIC in English  
Jun/Jul 93 pp 38-39*

[Text] Agreement was unanimous in Luxembourg on 29 April when, under the presidency of Svend Bergstein, Danish minister for technological development and applied research, the Council debated the future of European research and the broad outlines of the Fourth Framework Programme for Community Research and Development over the next five years (1994-1998). Although a budget has yet to be defined, it is expected to be finalised this month, once experts from all countries have completed their analysis of the Commission's propositions.

Spurred on by determination to maintain balanced development, the Community hopes that the Fourth Framework Programme will help "industry benefit from more investments" and "strengthen economic and social cohesion." An ambitious programme which aims to get the Commission to lend its support to "precompetitive research and applied research throughout the different sectors of industry."

Behind the bureaucratic jargon, the essence of the Fourth Framework Programme's message has been to highlight three major weaknesses in Community research policy.

Firstly, the chronic lack of direction in research. Present research is far too unfocused and as recently as last March the Commission admitted that there was "a lack of projects of a genuinely technological nature" and "a tendency to continue project financing by simple inertia." After having selected universities as the main target of its policies, inexplicably forgetting the needs of business and industry, the Commission then tried to correct the balance during the Third Framework Programme. Since then it has become clear that there is a need for a handful of specific, strategic research subjects with a clear leaning towards industry. If the Fourth Framework Programme is presented in its present form, it should be able to meet this need satisfactorily. In the introduction to the work document put forward by the new Commissioner Antonio Ruberti, one can discern a clear determination "to concentrate on a limited number of strategic areas." Eighty-seven point five percent of the total budget has been allocated to five areas of research in which technological progress will mean rapid and efficient applications and a boost to the economies of Europe. These include industrial technologies (16.5 percent or 1.805 million Ecu),



computer and communications technologies (36 percent or 3,933 million Ecu), biotechnology (12 percent or 1,311 million Ecu) and energy (23 percent or 2,513 million Ecu).

Antonio Ruberti stresses that the programme will include specific action to tackle those sectors of industry now in difficulty such as aeronautics and the car manufacturing industry. Europe is at a disadvantage compared to American and Japanese competitors because of the lack of standardisation of systems and patent rights in the Community. This is why the Commissioner intends to create a close link between national and community policies. There is still an enormous amount to be done but the Eureka programme would be a good place to strengthen cooperation.

The second weakness, so often cited, is the arduous and rigid procedures which have to be respected. The Fourth Framework Programme envisages simplifying procedures, especially for small businesses and industry. Thus there will be regular dates set for tendering offers and the "bottom up" procedure, which favours proposals from the grass roots, will apply more often.

Inadequate funding has characterised Europe's research programme since its inception. Europe spends a mere 274 Ecu per capita on research compared to 528 Ecu in the United States and 619 in Japan. Armed with a budget of 13.1 billion Ecu for the period 1994-1998, of which nearly 11 billion has been earmarked for research programmes, the Commission has recognised the importance of better financing.

This programme also incorporated a series of complementary measures, designed to back up the research projects. Seven hundred and ninety million Ecu have been put aside for "cooperation with third countries and international organisations."

In keeping with the principle of mutual benefit, the countries of the European Free Trade Association, Central and Eastern Europe will all be encouraged to join in projects. A further 600 million Ecu will be used to "help spread and make good use of research results." This implies the transfer of technology and financing. Lastly, 78.5 million Ecu will be spent on encouraging "training and researcher mobility." Here the aim is to develop a human and scientific research pool. One innovative measure is the 1 percent (109 million Ecu) allocated to the development of technological forecasting, research into education and evaluating problems of social integration in major urban areas.

On paper, the Fourth Framework Programme appears to be a driving force behind a new boom for European industry. If the political determination to implement the programme does not wane, this ambitious programme can succeed. And it is to be hoped that another year will not be wasted in the labyrinth of European bureaucracy.

#### **4th Programme 1994-1998**

Areas of Research and Break-Down of the Fourth Framework Programme for Technological Research and Development in the European Community (1994-1998)

##### **First Action**

Information and communications technology, development of information and communications infrastructure.

Telematics technology and general applications.

Integrated systems technology for information and communications.

Advanced communications services technology.

Information technology.

##### **Industrial Technology**

Conception engineering technology, production and human organisation systems engineering.

Advanced propulsion technology.

Research into standardisation, measuring and trials.

##### **Environment**

Natural environment, its quality and global changes.

Innovative technology for environmental protection.

##### **Living Science and Technology**

General biotechnology.

Biomedicine, health and drugs.

Application of living science and technology in agriculture, forestry and rural development, agri-food industry and fishing.

##### **Energy**

Technology permitting cleaner and more efficient energy production.

Nuclear safety.

Controlled thermonuclear fusion.

##### **Research for a European Transport Policy**

Search for a Paneuropean common policy

##### **Socio-economic Research**

Research into problems of social integration.

Research into education and training.

Revaluation of options for a science and technology policy.

##### **Second Action**

Scientific and technological research in Europe.

Scientific and technological research, cooperation with non-European industrialised countries.

Scientific and technological cooperation with developing countries.

##### **Third Action**

Circulation and application of results

Technology transfer.

Financial aspect or transfer.

Scientific service for community policy.

##### **Fourth Action**

Training and mobility amongst young researchers.

## Germany: Fraunhofer Society's Accomplishments, Problems Viewed

### Cuts in State Financing

93WS0717a Frankfurt/Main FRANKFURTER ALLGEMEINE in German 23 Sep 93 p 21

[Article by gl. "Fraunhofer Society Closes 'Income Gap'. Syrbe Warns of Additional Cuts in State Financing of Research Projects" first paragraph is FRANKFURTER ALLGEMEINE introduction]

[TEXT] Hans-Juergen Warnecke, the future president of the Fraunhofer Society, believes that Germany needs to improve its ability to apply scientific developments. Scientists ignore the need to market their findings, and industry does not fully grasp them. The scientist must be more than "just" a scientist; he must, like an enthusiastic inventor, "sell" his findings. Knowledge in and of itself is of no value, says Warnecke. It must be put to use in society; otherwise, we should question its value.

The Fraunhofer Society, which, with its 47 institutes, is one of the largest German research institutions, feels "severely handicapped" by reductions in state financing. Max Syrbe, president of the society, complained in Munich that state funding of research projects has been dramatically cut by the Federal Ministry for Research Development and several of the laender. This has resulted in a "gap" of approximately 70 million German marks [DM] in the area of "contract research," says Syrbe, who will step down at the end of this month because of his age.

Although the Fraunhofer Society expects to receive 15 percent more funding (for a total of DM 941 million) in 1992, this figure does not provide an accurate picture of the situation, as it reflects for the first time the DM174 million provided to the 13 Fraunhofer Institutes in the new laender. The Fraunhofer Institutes in the old laender actually received 7 percent less funding, for a total of DM767 million. Hans-Juergen Warnecke, who will take over for Syrbe on 1 October, expects state financing for research projects to stabilize at a lower level. Syrbe estimates that public funding constitutes approximately 60 percent of the total funding received by the society and orders from industry approximately 35 percent. Warnecke does not expect to receive all of the DM1.01 billion originally called for in the 1993 budget.

According to Syrbe, the decrease in government funding has been partially offset by cost-cutting efforts, increased grants from trust funds, and increased profits from research contracts from private industry (DM191 million as compared to DM183 million the previous year). He states that the Fraunhofer Society increased its marketing and acquisition activity, something which is not altogether easy for a scientific institution. Nonetheless, the reductions in funding were painful, and had an effect on research and development expenditures.

As a result, the Fraunhofer Society, which has more than 700 members, including both private citizens and commercial enterprises, plans to increase its rationalization efforts and step up its pursuit of research contracts from private industry. Two years ago, the society established the Fraunhofer Management Society mbH in Munich, which offers

"advice and service in the area of research management." The Fraunhofer Society also hopes to profit from the "need for restructuring" within the German economy. German manufacturing costs are often 25-30 percent higher than those of the most successful international competitor within their respective industry. Warnecke adds, "Companies are in shock. They are beginning to restructure, and many Fraunhofer Institutes are involved in that restructuring."

### Stress on Private Contracts

93WS0717b Duesseldorf HANDELSBLATT in German 28 Sep 93 p 28

[Article by unidentified author: "Research Contracts Oriented More on Product" first paragraph is HANDELSBLATT introduction]

[TEXT] Reductions in state funding have led the Fraunhofer Society (FhG) to work more closely with industry and orient its research more on the market. In conjunction with this, the society is expanding its focus, to include not only technical fields, but operational procedures as well. The performance of the eastern German Fraunhofer institutions has exceeded expectations.

The 48 institutes and institutions of the Munich-based Fraunhofer Society conduct research into those areas specified by their customers—commercial establishments and public agencies—and "changes in subject material or shifts in emphasis are approached very cautiously." This statement was made by Dr. Max Syrbe, outgoing president of the Fraunhofer Society, at the annual press conference held in Munich on 22 September. He adds that trends can be easily recognized. For example, commercial interest in subjects such as solar energy has decreased noticeably. Syrbe believes that this is because it is not yet marketable. The society will continue to conduct research into alternative energy sources, however, particularly into their thermal application.

Syrbe explains that the market tends to steer research primarily towards subjects that yield rapid results, and reductions in state financing make it difficult for the society to interest private enterprises in subjects which, while they may be important in the long run, are not profitable. The future president of the FhG, Dr. Hans-Juergen Warnecke, who has been the director of the Fraunhofer Institute for Production Engineering and Automation (IPA) in Stuttgart since 1971, gives an example of this. "We have been addressing environmental issues, above all recycling and production engineering, in our research papers for ten years now, but it has only been in the last five years that industry has begun to show an interest."

Warnecke would like to see FhG contract researchers continue to address long-term perspectives. This includes not only new techniques and products, but also, to an increasing degree, operational procedures. "Germany's weaknesses in international competition are only partly due to production problems. In the manufacturing industry—and in other industries as well—organization is equally important." It is essential that the vertical interruptions in the value creation chain be at long last eliminated. Contract research into automation must investigate and organize operational procedures.

At the same time, the FhG is evolving from a technical laboratory devoted exclusively to the development of new materials and better products into a research institution that also addresses organizational issues. The society must prepare itself for other changes as well. Max Syrbe explains: "We are becoming involved in research and development (R&D) work at an increasingly early stage. Companies that used to worry about trade secrets are now discussing their plans with us and utilizing our resources from the very beginning." This is due in part to the trust built up over many years, but it is also the result of reduced R&D funds.

The majority of the research conducted in 1992 was in the field of microelectronics. One hundred forty million German marks [DM] was spent on this subject alone. This was followed by production automation, with DM120 million, information technology, with more than DM100 million, materials and component development, with just under DM100 million, production engineering, with DM85 million, chemical engineering, with DM70 million, environmental and health sciences, with DM65 million, power and structural engineering, with DM49 million, and scientific and technical studies, with DM30 million.

According to Syrbe, the Fraunhofer institutes themselves have already become more "commercial." Less state financing has prompted them to accept more research contracts from private industry. In the old laender, the Federal Ministry for Research and Technology (BMFT) and the individual laender reduced funding of contract research by DM70 million in 1992, or 32 percent. "That is more than has been asked of any other comparable institution," declares Syrbe.

The Fraunhofer Society has made up the difference by doing more contract research and reducing its material expenses. Aid from industry and trust funds has also helped. The total funding received by the Fraunhofer Society in 1992 rose by 15 percent, to DM941 as compared to DM821 million the previous year. This figure is expected to reach DM1 billion in 1993 and DM1.32 billion in 1994. However the 1992 increase reflects the DM174 million received by the FhG institutes in the new laender.

The FhG institutions in the new laender have done better than expected. Their expenditures will increase to DM220 million this year, and are expected to reach DM245 million in 1994. The 1992 budget called for the eastern German FhG institutions to cover 15 percent of their operating expenditures with their own profits; they were in fact able to cover 22 percent. They did so by conducting contract research for the federal and state governments, taking part in cooperative projects, working for the German Research Association (DFG), and earning DM13.4 million in industrial contract research.

It is expected that the eastern German institutions will be able to cover 25 percent of their operating expenditures in 1993, and as much as 30 percent in 1994. "Not only have the eastern Germans made a name for themselves as scientists," says Syrbe, "they have proved to be smart businessmen as well."

The 10 "institutions" and 12 "branches" of the FhG in the new laender employ approximately 1,000 permanent personnel, which is proportionately equal to the 4,000 personnel employed by the FhG in the old laender. The society

plans to upgrade the majority of the eastern German "institutions" to full-fledged "institutes" at its annual meeting, which is to be held in Karlsruhe on 27 October. "The Fraunhofer Society organizations in the old and new laender work together with no friction whatsoever," declares Syrbe. "We have done away with borders, both in our work and in our minds."

### **Ireland Establishes Research & Development Fund**

93WS0607J Dublin IRISH INDEPENDENT in English  
25 Jun 93 p 5

[Article by Annemarie McEneaney]

[Text] Irish firms are risking jobs and ignoring technology "at their peril," Minister for Commerce and Technology Seamus Brennan warned yesterday as he announced the establishment of a £1m fund to encourage research and development.

Irish companies are to be persuaded to participate in Eureka, a pan European network specifically aimed at facilitating cross-border research between its 20 member states.

Speaking at the Eureka ministerial conference in Paris yesterday, the minister warned that Irish companies were in danger of being left behind in the international market because of their failure to fund research and development.

"Complacency is deadly—current successful companies will wake up soon and find that someone has improved their product and they are facing job losses," he stated.

Firms must put more of their funds back into developing their products. At present Irish companies re-invest only 0.8pc (£180m) of their profits in research—US companies on average invest around 7pc.

Mr Brennan said he intends to set a minimum research and development target which companies will be encouraged to reach.

### **FRG Research Minister on Key Technologies**

93WS0701 Hamburg DEUTSCHES ALLGEMEINES  
SONNTAGSBLATT in German 3 Sep 93

[Article by Paul Krueger, German Minister for Research and Technology: "New Strategies for the Future, Research Policy Cannot Solve the Economic Crisis, Can Increase Innovation in Industry"]

[TEXT] Germany, as a high-wage country, cannot maintain and improve its position in the world market and its high standard of living with simple "inexpensive products."

Germany's competitive advantage lies in high-quality, technically outstanding products requiring highly qualified workers and a high degree of scientific, technical, and organizational knowledge.

The future of the German economy depends on our ability to maintain our technological edge. The recession makes the need to make structural changes in the economy and in the

public sector painfully obvious. Nonetheless, the central theme of research policy is not "Crisis Management," but "Strategies for the Future."

One prerequisite for fundamental research policy decisions is a fundamental consensus on foreseeable developments, in other words, a common vision of the future in terms of policy, industry, and science.

This is the reason for the continual conferences designed to develop models for the technological future of Germany, models that will enable industry and the scientific and political communities to concentrate their resources and jointly pursue the stated objectives without abandoning or undermining their respective responsibilities. German research policy must establish clear priorities for the coming years. State funding for research will be concentrated on ecological research and environmental engineering, health research, energy research, power engineering, traffic engineering, and traffic system research.

On the subject of key technologies for the future, because of our commitment to the public welfare, we are identifying and pursuing those technologies that we expect to have a particular impact on the ability of Germany to compete technologically and the German quality of life. Such technologies must demonstrate two characteristics: They must conserve resources and protect the environment, and they must enable us to find solutions to existing problems without causing damage elsewhere.

Important technological fields that meet these requirements include computer science, biotechnology, and new material and physical technologies such as superconductors and lasers.

Specific measures to strengthen our technological competence in these fields are essential to the competitive ability of the German economy. Nonetheless, state assistance and initiatives cannot replace efforts by private industry. Only commercial enterprises, with their experience and knowledge of the market, can determine what is actually important.

One of the most important strengths of the German economy is its wealth of innovative small and mid-sized companies and the ability of these companies, as innovators, to promote the spread of new technologies. Because of the importance of small-scale industry to the ability of the German economy to compete technologically, the research ministry plans to increase aid to small and mid-sized enterprises and restructure the system used to distribute this aid, clarifying and simplifying it.

An important new approach to this is the financial support of national and transnational cooperative efforts between small businesses. These efforts represent important innovative resources that must be better utilized. Germany is a world leader in the area of basic research. Nonetheless, we must improve our ability to translate this ability into technological breakthroughs that will result in competitive advantages in the marketplace.

The attainment of complete unity within the eastern and western German scientific communities continues to be of top priority. Crucial to this is industrial research in the new laender, which has dwindled dangerously. It is industrial research and development which must create new products

that find a market throughout the world. The manufacture of these products will result in permanent jobs, and their sale will bring in the money desperately needed to finance the economic reconstruction of the new laender.

Investments in new factories and machines are futile if "research investments" do not result in the development of new products that can be manufactured in these factories and later sold.

Not only Germany, but Europe as a whole is increasingly regarded as an important center of research and development. For this reason, to enhance national research efforts, the research ministry plans increase its support of European-wide innovation strategies and cooperation. To this end, it is important that small and mid-sized enterprises have improved access to EC funding. Current European research programs do not fully exploit the potential represented by mid-sized companies.

In addition to these measures taken to improve research funding, future research policy must also increasingly address legal conditions affecting research and innovation in Germany. For example, the law governing genetic engineering must be amended. This law frequently creates unnecessary obstacles to research in this field and puts German genetic engineering research at a disadvantage internationally. Eliminating such obstacles, most of which are unnecessary, can at times benefit German research even more than additional funding.

In addition to improving the legal framework, we must also work to restructure the German tax system so as to encourage innovation. In contrast to its most important foreign competitors, the German government offers no special tax incentives for industrial research and development.

We must keep in mind, however, that one of the most important prerequisites for success in research and development is the willingness of the people to accept technological innovations. Studies on this subject commissioned by the research ministry have shown that despite the hostility towards technology that has unfortunately become popular with many people and with the press, the overwhelming majority (76 percent) of all Germans are convinced that scientific and technological breakthroughs benefit them. Encouraging openness to technological progress is an ongoing task which extends far beyond the capabilities of the state. I therefore challenge scientists and technicians to make themselves more understandable. This is an obligation to the public that should be made a criterion for financial support.

It is not necessary to "sell" every potential breakthrough to the public. Rather, a well-informed public should be advised of new technologies that could prove beneficial. As taxpayers, these people contribute to the funding of research. As consumers, they determine the success or failure of new products. Finally, as mothers and fathers, they share in the responsibility for decisions that will affect our technological future. Only if the German people are open to technological progress can we maintain and improve the quality of life in this country and translate the inventiveness of our scientists and engineers into prosperity.



### German Government Presents 1993 - 1997 Budget

MI0610111793 Bonn TECHNOLOGIE-NACHRICHTEN  
MANAGEMENT-INFORMATIONEN in German  
30 Aug 93 pp 2-7

[Text] The federal government has presented the 1993-97 federal finance plan. It is based on the macroeconomic forecast made in early 1993 that the gross domestic product of Germany as a whole will decline by about one percent in 1993 (West Germany - 1.5 percent). However, some research institutes forecast a rather sharper decline. But there is a broad consensus among the mid-term forecasts: Stagnation will not last and the economy will begin to recover by 1994 at the latest.

### Federal Expenditure Breakdown

#### Business Promotion

#### Energy

A safe, economic, and environmentally sound energy supply is essential for industrial Germany. The federal government's energy policy seeks to create the necessary conditions for it.

German coal mines make an important contribution to the energy supply. They are at the same time, of considerable social and regional importance for the mining areas. Substantial financial assistance is given to protect them because production costs are high compared to other countries. Coal aids paid by the federal government and the mining laender will total some 3.8 billion German marks [DM] in 1994. The largest single item is the coking coal equalization grant at around DM2.7 billion (federal contribution DM1.9 billion). The further reduction in production capacity introduced in the 1991 coal round and brought forward because of the steel crisis is accompanied socially by the authorities with adjustment aid and balance sheet aids (aids to deal with the charges to the balance sheet of redundancy schemes and other closure costs).

For 1995-1997 the finance plan assumes that in view of the regional policy significance of the aids, the mining laender will contribute 50 percent (previously normally one third) of the coking coal equalization grant and that they will from as early as 1994 contribute 50 percent to the repayment of inherited debts.

In addition, the use of German coal to generate electricity has since 1992 been subsidized from the electricity generation fund, whose resources are drawn from a compensatory levy (coal levy) on electricity consumers. The fund's total expenditure in 1993 will be DM5.1 billion (economic plan estimate). The amount for 1994 has not yet been determined.

DM440 million in 1994 and DM60 million in 1995 are allocated to servicing the former GDR's (German Democratic Republic) cooperation agreement with the former USSR for participation in the Yamburg natural gas project. New terms for liquidating the Yamburg project are still being negotiated with the Russian Federation.

#### Other Sector-Based Funding

The technological importance of the German aviation industry is manifested in the funding of civil projects in that

industry, primarily within the framework of European joint ventures. The purpose of the support is to strengthen industrial self-reliance by creating equality of opportunity in international competition. A contribution of just under DM196 million is earmarked for the support of civil aircraft manufacture in 1994, after approximately DM362 million the previous year.

Most of the funds will go to the Airbus program, the most important European joint venture, which is now established on the commercial aircraft market. Further subsidies totaling DM675 million will go to the twin-track Airbus A330/A340 program in the remaining development period 1993 to 1996. Around DM26 million (1993: ca. DM43 million) will go to a number of smaller projects in 1994. The payments towards the costs of developing civil aircraft to the production stage are conditionally repayable.

In addition, sales financing aids are paid under the OECD (Organization for Economic Cooperation and Development) sectoral agreement for wide-bodied aircraft to enable Airbus buyers to finance Airbus aircraft on the usual international terms.

Provision of DM830 million (1993: DM774 million) has been made for the ordered closure of the uranium mines and the reclamation and recultivation of the contaminated sites of Wismut GmbH (former Soviet-German corporation); there is provision for additional DM2,610 million up until 1997.

#### Small Businesses

The intensification and globalization of competition and the constant pressure for structural adjustment brought by new technologies and changing consumer desires place high demands on the adaptability of small and medium-sized enterprises. To increase the efficiency of small and medium-sized enterprises and liberal professions, the federal government provides assistance in the fields of information, advice, training, research and development, and technology transfer. There is particular emphasis on help with starting a business. Overall, the measures show a strong preference for the new laender.

Funding technology transfer aims to improve the technological infrastructure of small and medium-sized firms. It is concentrated in the new laender. An important project there is the setting up of 22 agencies for technology transfer and innovation support and of seven technology-specific centers: DM40 million will be spent on this in 1994 and DM71 million in 1995-1997.

Assistance with research personnel costs and innovation helps small and medium-sized firms in the new laender to restructure and strengthen their technological potential and to develop new products and processes (staff costs subsidy program 1994: DM70 million; 1995-1997: DM157 million; support for innovation 1994: DM50 million; 1995-1997: DM105 million).

The research and development establishments hived off from former state-owned companies and combines are granted subsidies to enable them to carry out research projects for a transitional period (1994: DM150 million; 1995: DM50 million to support projects in industry-related research establishments).

In its support for research, development and innovation in small and medium-sized firms, the BMFT (Federal Ministry For Research and Technology) is taking the following measures, concentrating on the new laender:

- Support for an increase in research personnel (1994: DM24 million, 1995-1997: DM74 million);
- Contract research and development (1994: DM50 million plus DM8 million in budget section 60 (BMW [Federal Ministry of Trade and Industry]); 1995-1997: DM93 million);
- Assistance with the foundation of technology-oriented businesses and the setting up of technology and new business centers (1994: DM54 million plus DM16 million in budget section 60); 1995-1997: DM103 million);
- Introduction of CIM [computer-integrated manufacturing] technologies (1994: DM50 million; 1995-1996: DM22 million).

In the country as a whole the BMFT is supporting the innovative capacity of small firms by making available R&D [research and development] loans and risk capital for new technology firms. DM38 million are available for this for 1994 and a further DM183 million up to 1997.

A new measure called "research cooperation in small businesses" will open up cooperation between firms as a strategy for innovation in small businesses, too. DM22 million are allocated for this measure in 1994 and a total of DM168 million for 1995-1997. In addition, the BMFT has created special facilities for smaller firms in its special programs. In 1994 BMFT support for small and medium-sized enterprises will total some DM600 million plus DM24 million from budget section 60.

#### Research, Education and Science, Cultural Affairs

##### Science, Research and Development Outside Universities

The central task in the field of research in the next few years is to create an efficient research landscape in the new laender. Under Article 38 paragraph 6 of the Unification Treaty, specific pump-priming measures have started, such as the continuation of the well-tried "Increasing Industry's R&D Capacity," "Sharing The Innovation Risk," and "Contract Research And Development" programs. The setting up and expansion of new research establishments, mainly emerging from those institutes of the former GDR Academy of Sciences positively appraised by the Science Council and now jointly sponsored by the federal government and laender under Article 91 B of the Basic law, will continue with increasing resources.

Support for basic research continues to be one of the main thrusts of research policy with a high proportion of BMFT research and development expenditure. Special mention should be made of the higher than average increases in grants to the Max Planck Society, construction of the new BESSY II electron synchrotron in Berlin, and the use of the large plant set up in past years with considerable amounts of public funds. In the field of precautionary research, ecology, climate research and health research are to the fore. The pressing global and regional ecological problems need to be thoroughly and comprehensively understood and

addressed. At the same time, possible solutions and technical alternatives need to be developed which do not lose sight of the ecosystem as a whole. The same applies to social problems. The state-supported research projects set the course here in, for example, the investigation of global climate changes, but also in the humanities and social sciences.

Research and development expenditure on state longterm programs goes mainly to space research, but also to oceanic and polar research, and to fusion research to safeguard the energy supply in the longterm. European space research cooperation within ESA (European Space Agency) will be continued. The federal government intends to negotiate with its partner countries for a new direction for the European space program to take account both of the changes in the world political scene in recent years and of the ESA member states' financial means. New priorities will be set, favoring in particular Earth observation to safeguard the world environment.

The concentration of Federal support on state responsibilities has led to a continued decline in support for industrial technologies. These center on the strategic technologies for the 21st century that will be crucial for the future competitiveness of the German economy. Support for technology and innovation is concentrated on such modern key technologies as biotechnology, physical and chemical technologies, laser research and transport technology.

In the plan period, the ministry has about DM622 million available to fund pilot projects for reducing environmental pollution. DM83 million are earmarked for projects in the new laender in 1994 alone.

A further DM174 million are provided in the plan period for pilot projects in foreign countries for reducing trans-boundary environmental pollution, particularly in matters of clean air and water protection. DM186 million will be granted to major nature conservation projects, primarily for acquiring land so that the nature and landscape in typical areas of national importance can be permanently safeguarded.

In view of the enormous environmental challenges in the Commonwealth of Independent States and in the countries of central and eastern Europe presenting a potential threat to the whole world, consulting services to these nations will be continued in 1994. DM31.2 million are provided, including DM25.4 million solely for consulting and construction aid for nuclear safety and radiation protection.

But the growth in the environment budget alone is no indication of the federal government's total environmental expenditure. The plans of many other departments, too, include expenditure for environmental protection and improvements to the environment.

Federal environmental protection expenditure will amount to some DM9 billion in 1994. The Federal Government is also making available additional DM2.6 billion in environmental protection credits from the ERP (European Recovery Program) special fund through the German Equalization Bank.

A large proportion of federal environmental protection expenditure comes from the BMFT's budget for related basic research (1994 approximately DM1.48 billion). The



Federal Ministry for Economic Cooperation assists third world countries with DM1.63 billion in the form of development aid and through international organizations for implementing and initiating environmental protection measures.

A large amount of the financial aid for joint tasks under Article 91 a of the Basic Law is used for environmental protection. For example, much of the DM554 million the federal government makes available to the new laender for the joint action to "improve the structure of agriculture and coastal protection" will be spent on water management measures.

The Osnabruck-based German Federal Environment Foundation set up by the federal government in 1990 is a source of additional funding outside of the federal budget. It has a trust capital of DM2.5 billion from the privatization proceeds of Salzgitte AG.

The foundation began its supporting activities in 1991 with environmental protection projects concerning small businesses in particular, and with an emergency program for the east, setting a remarkable pointer for aid to the new laender. Of the 216 projects newly approved in 1992 and receiving approximately DM104 million in subsidies, 119 are in the new laender, receiving DM62 million.

In order to effectively face the threat to the population from AIDS/HIV viruses, the federal government has since 1987 been carrying a priority program to combat AIDS. It aims to avoid HIV infection by means of education and counseling in particular, and to prevent or at least delay the outbreak of the illnesses. Support is also given to pilot projects to counsel and assist those infected. However, since health care and preventative medicine are primarily the responsibility of the laender, the federal government will be gradually withdrawing support from these measures between now and 1997.

Funds will also be made available for AIDS research, particularly for the development of vaccines. In all, DM40.8 million are available for the fight against AIDS in budget plan 15 for 1994, DM30.8 million for 1995, and DM23.8 million for 1996. From 1997 funding is provided only for research.

As the most important interdisciplinary technology at the moment, information technology is also one of these priority fields; this is also evident from the total volume of state funding (federal, laender, research institutes), approximately DM1.8 billion a year in this instance.

#### **Joint Task "Expansion and Development of Universities Including University Hospitals" and University Special Programs**

The expansion and development of universities including university hospitals is one of the joint tasks of federal government and the laender included in the Basic Law. To fulfil this task, the federal government is making DM1.68 billion available for 1994 and a total of DM8.16 billion for the finance plan period for projects which the university building planning committee will take into its master plan. In the next few years support will be concentrated on organizing and expanding the eastern German university landscape and expanding professional schools.

The federal government is involved in three university special programs with a federal contribution totaling over DM2 billion in the plan period. Special programs I and II will improve the situation in particularly overloaded courses of study, safeguard the efficiency of universities and research and encourage a new generation of scientists. The renewal program for universities and research in the new laender (running from 1991 to 1996) enables immediate action to be taken to decisively improve the quality of research and teaching there.

#### **Supporting the Training of a New Generation of Scientists**

The federal government has a number of measures to support the training of a new generation of scientists. These measures are complemented by corresponding laender programs. Postgraduate work in particular subjects is supported with scholarships through the institutional sector, that is via major research establishments, the Max Planck Society, and the Fraunhofer Society. The federal government also spends about DM15 million a year on a program of its own to support these highly qualified new graduates. Federal expenditure for student grants and periods of residence abroad for students, academics, and young scientists remains at a high level; a total of some DM835 million are therefore earmarked for this in the finance plan period. The federal contribution to supporting graduate colleges, made through the German Research Society (DFG) by arrangement with the laender, is planned to be around DM105 million over the period in question, together with about DM50 million a year in other DFG special programs.

#### **Environmental Protection, Health**

In the 1990's the protection of nature and the environment remains one of the greatest challenges, which in the light of global environmental problems can only be tackled by joint action at international level.

The main thrust of the federal government's environmental policy is that the social market economy should be guided by ecological principles. This is all the more applicable in times when the budget is extremely tight and there is no way that the public purse can assume the costs of environmental pollution. What is rather required is a consistent enforcement of the principle that puts the costs on the person responsible for the pollution.

The growth in environmental protection expenditure is an important indicator of the extent to which this principle has become accepted and also of the increasing importance of environmental protection for the economy and of increasing environmental awareness. In the case of manufacturing industry and public authorities this crucial environmental protection expenditure by polluters amounted to a total of DM38.2 billion in 1990. Of this, investments for environmental protection amounted to DM17.6 billion.

The federal government's interdepartmental environmental policy will concentrate particularly on:

—Supporting pilot schemes for reducing environmental pollution, especially in the new laender, and

—Advice to the states of central and eastern Europe and the Commonwealth of Independent States (CIS) in environmental protection, nature conservation, and nuclear safety matters.

The Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety's total budget for 1994 amounts to approximately DM1.4 billion.

Funding technology transfer aims to improve the technological infrastructure of small and medium-sized firms. It is concentrated in the new laender. An important project there is the setting up of 22 agencies for technology transfer and innovation support and of seven technology-specific centers: DM40 million will be spent on this in 1994 and DM71 million in 1995-1997.

Assistance with research personnel costs and innovation helps small and medium-sized firms in the new laender to restructure and strengthen their technological potential and to develop new products and processes (staff costs subsidy program 1994: DM70 million; 1995-1997: DM157 million; support for innovation 1994: DM50 million; 1995-1997: DM105 million).

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### Germany: Priorities, Prospects of German R&D Outlined

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### Prospects for Research and Technology Policy in Germany

Our country is facing great challenges. The Federal Ministry of Research and Technology (BMFT) is rightly expected to help to meet them. This paper carries on from the BMFT "General Policy Statement" presented to the public in March 1993.

- As in all industrial countries, we need most of all to create new jobs with a new spate of growth and competitive new products and services.
- We also know that this growth must be more consistently ecologically sound than before. Products and processes that are less harmful to the environment will be an important part of future growth.
- Germany is also faced with the central task of bringing East and West together not only politically but also economically and culturally and thus not least in research and technology. Here, too, German unity needs to be completed as well as a bridge built to the countries of Eastern Europe.
- Finally, Germany must remain a major industrial and cultural center in a converging Europe and thus a strong base for industry, services, research, and development.

### Problems of German Society

- There is a fear of technology instead of a desire to create. Efforts are directed at "fencing in" innovative potential instead of releasing and encouraging it.
- Hysteria, even in the face of small initial steps into the technological unknown, often takes the place of justified vigilance, sobriety, and confidence in our own creative power.
- We leave the spearhead of innovation to others, like the Japanese, instead of daring to experiment and innovate on a broad front.
- This makes Germany's potential high-performing innovators inclined to emigrate.
- Some scientists regard their fields of research as fee tails instead of being agile, dynamic, and flexible in competing for sponsorship.
- Barriers between science and industry, between developers and users, and between technology and culture prevent know-how of different kinds being brought together in new products and processes.

### Starting Points for Research Policy

- The BMFT wishes to give fresh impetus to the debates about genetic engineering and energy, traffic solutions and information technology, and the outlook for new technologies generally.

- The BMFT's aim in this is not controversy but to create new models corresponding to what most people in our country expect of the future.
- Competition for research funding will be encouraged by objective procedures, rewarding success, movability, and ideas, instead of giving permanent sponsorship.
- The BMFT wants to give organizations the conditions for more competition and greater mobility, for more grass roots initiative.
- The BMFT wishes to create greater coordination between industry, science, and policy, with measures to improve cooperation between industry and science and in strategic dialog with the parties involved.
- The BMFT will "thin out" fields such as legislation that stand in the way of research and try to get the regulatory framework improved.
- Research policy should be more involved in the public debate about technology and jobs, about creating instead of hindering, about opportunities instead of resignation. Despite its current economic tasks and problems, Germany must remain the driving force for progress in Europe and the world that it has traditionally been, based on its scientific, technological and innovative potential. This is our traditional strength and it is at the same time our future.

### I. Research Policy Priorities

#### 1. Serving the Common Good

Germany leads the world in knowledge-oriented basic research in many fields. Such research is the basis for new technologies. Excellence in basic research therefore needs to be further enhanced and our leading position consolidated. The above-average sponsorship of the Max Planck Society is a concrete example here.

The heavy investments made in instruments and plant for basic research must now justify themselves by paying off scientifically. Sensible use of them is therefore now a priority.

Applications-oriented basic research will also become increasingly important, bringing us fresh knowledge in important fields. The BMFT will give priority to supporting targeted research.

In view of the tremendous challenges facing us, special attention will be given to shaping and providing for the future for the common good with ecology research and environmental technology, health research, energy research, and transport research.

#### Ecology Research and Environmental Technology

In the environmental field we must cope with a challenge of global dimensions: The transition to a sustainable development of our economy and society as agreed at the highest political level by the 1992 UNCED [United Nations Conference on the Environment and Development] Conference in Rio de Janeiro. This transition can be guaranteed only by preventive environmental protection integrated into the production process.

Ecology research and environmental technology are BMFT priorities. The BMFT will therefore before the end of the year be presenting a new environmental research plan with new emphases. The plan's purpose will be to bring together existing knowledge of the environmental system on the one hand with the technologies for solving environmental problems on the other.

#### **Health Research**

Together with environmental research, health research is one of the BMFT's important tasks in providing for the future.

The course was set for the future in this field with the "Health Research Program 2000" in early 1993. It will focus on such diseases as cancer, AIDS and other infectious diseases, and cardiovascular diseases.

There is a particularly new element in measures to improve clinical research at universities. The BMFT will for the first time support the setting up of model centers for interdisciplinary clinical research in the initial stages. They will bring joint ventures in biomedical basic research, in particular molecular biology, and developments in practical medical diagnosis and therapy, together in a new form of organization. The program will also determine points of main effort in preventative medicine.

The further search for biotechnological processes in medicine, from making drugs by genetic engineering through diagnostics to the specially sensitive areas of gene therapy also deserves special attention.

#### **Energy Research and Technology**

An environmentally sound energy supply remains a vital problem for mankind. Even if the energy supply in the western industrial nations is secure, innovation strategies are required in two directions: Energy saving and the development of so far as possible environmentally friendly energy. Environmental compatibility is important not least because of the greenhouse effect. Future support for the development of nuclear technology can only be based on an energy consensus with a secure future and reliable financing on users' responsibility. For the present we must not simply abandon existing options.

The BMFT seeks to pave the way for energy research with its energy research program: For improved energy supply prospects, for greater safety in the use of nuclear energy, for renewable energies and the application of new energy saving methods, and for an effective strategy to reduce CO<sub>2</sub> emissions.

#### **Transport Technology and Transport Systems Research**

Environmental problems and measures to maintain mobility are becoming increasingly urgent in the transport sector. Transport contributes 20 percent of CO<sub>2</sub> emissions. Because Germany is now more than before an east-west transit country, traffic is expected to increase sixfold by the year 2010. Passenger traffic is expected to increase by around 30 percent and freight around 75 percent by 2010.

The central principles for transport research and technology will therefore be to optimize transport links and secure environmentally harmless mobility.

The key concept for solving these problems is "integrated transport". We need more cooperation between rail, road, air and inland waterways with the objective of integrated freight transport chains. We need more information about the location and movement of goods, with tailor-made information technology and more "integrated management." There must also be greater and more flexible opportunities to change from the car to local public transport. The same applies for optimizing traffic control systems. To preserve individual mobility we urgently need to improve the traffic flow in private transport.

Attention still needs to be given to the meaningful contribution that Transrapid is able to make both as a transport system and from the ecological point of view. Transrapid should also be built with a fair share of the costs between industry and the government for the sake of a meaningful and acceptable sharing of the burden between land and air transport in Germany.

#### **2. Key Technologies for the Future**

The population will in future find economic growth acceptable only if it is ecologically sustainable and safeguards the interests of future generations. So we must find a way to get by while using much less natural resources in the economic process. Savings on raw materials and energy consumption are essential.

The BMFT is giving particular attention to correlated technologies that make new products and processes possible across a large number of sectors and at the same time have the potential to save resources and spare the environment.

This is particularly true of information technologies, whose strategic importance lies in their related effects on many other areas of industry and science. The progressive integration of information as a "raw material" into technical or biological systems, e.g. in photonics, and molecular and bioelectronics, opens up new prospects for major advances in information and communications technology in all parts of the economy and society.

Another priority is the support of biotechnology. Apart from the interfaces with information technology already mentioned, the need here is to bring on key areas of technological development, from biosensors through molecular biology to genetic engineering with their applications in chemistry, pharmaceuticals, medicine, and agriculture.

The biological processes on which biotechnology is based are cyclical processes that use renewable raw materials, operate under mild reaction conditions and with minimum energy consumption, produce a minimum of biodegradable residues, and in many cases draw their energy from the sun. Overall, biotechnology has the potential to make a significant contribution to saving resources.

Research into physical technologies and new materials is also very important. This concerns superconductivity and laser research, electronic and photonic materials, new polymers, functional ceramics, heavy-duty metals, and multifunctional materials.

Specific measures to enhance our technological competence in the key technologies of information technology, new materials, physical and chemical technologies, laser



research, and biotechnology will be crucial for the German economy's competitiveness at the beginning of the 21st century.

Government financial aids are in no wise a substitute for the efforts industry must make itself. Only if there is a clear division of roles between industry and the government can research policy contribute to accelerating technology transfer and the tempo of innovation, and in this way secure German industry's market opportunities.

### 3. Completing German Unity in Science and Research

The new laender still have a lot to do in building modern research and technology structures as part of their tremendous restructuring process. Whilst there have been successes in building Max Planck, Fraunhofer and blue list institutes in the new part of the Federal Republic, here, too, there is still work to be done. The Max Planck Society in particular, which initially created the basis for high quality basic research by setting up temporary working teams at the universities of the new laender, is now expected to form institutes.

One of the central challenges facing research policy is to bring about German unity in the field of science and research.

The situation is particularly critical in industrial research. Only 2.5 percent of Germany's research-intensive exports come from the new laender. There is now a priority need to provide and further expand efficient R&D capacities in the new laender, thereby improving firms' technological competitiveness.

Firms in the new part of the Federal Republic still have too few products in which they are internationally competitive.

A new "Joint Product Renewal Initiative" will assist the rapid development of new products in selected fields of key technologies in order to acquire competitive advantages on world markets on the basis of modern high technologies.

### 4. European Outlook

A forward-looking German research policy must give special attention to European perspectives. The Treaty on European Union and the growing integration of central, eastern and southeastern Europe bring new opportunities for research and technology policy. With this in mind, the BMFT will increasingly be advocating international innovation strategies and European cooperation (EUREKA, COST [European cooperation in the field of scientific and technological research] and Community programs) and the further development of EC [European Community] framework programs to complement national efforts. It will also be looking for greater cooperation between research establishments in Europe.

At the request of scientific organizations, the BMFT will be asking the EC Commission to introduce a more transparent and more efficient procedure for deciding on applications for support. A competent appraisal of scientific and technical quality is crucial for the sponsorship of forward-looking projects of outstanding quality. The EC Commission should therefore pay greater heed to proposals from science and industry in the respective Member States when choosing its experts.

Small and medium-sized firms currently receive only about 15 percent of EC sponsorship. Support for these firms can be improved by opening special EC Commission offices in the Member States, giving special preferences to small and medium-sized firms, and allowing appropriate application periods and lead-times. There should at any rate be a fair relationship between the cost of making an application and the amount of funding received and project life.

Small and medium-sized firms should be given better access to EC funding. At present, insufficient use is made of such firms' potential.

German industry is very interested in the tremendous research and technology potential of central and eastern Europe. Together with German industry, the BMFT will improve the information available on research potential in eastern Europe and dismantle existing barriers to technological cooperation. Here, technological cooperation can pave the way for economic cooperation and trade relations to the benefit of both sides.

## II. Research Efficiency

Research and development expenditure is investment for the future. In the light of this, it is worrying that German industry has since 1989 been steadily reducing its contribution to financing national research expenditure. This trend urgently needs to be reversed if the technological competitiveness of Germany as a whole is not to be permanently weakened.

However, the scope of research and development expenditure alone says nothing about how sensibly the money is actually used. So as well as looking at the input into research, we also need to look increasingly at the results and ask how efficient the German innovation system is.

There are a number of criteria for research efficiency depending on whether it is basic research, applications-oriented research, or product-related industrial research.

The BMFT expects industry, and science in particular, to get to grips more with the matter of efficiency in research and make it increasingly a criterion for its activities, especially in research supported with public funds.

### 1. Structural Changes

The current recession is forcing industry to make careful decisions about how its reduced research budget will be used. Firms will do everything to increase the efficiency of their research and development and will be guided by efficiency criteria when allocating their research budget. The same should apply to publicly-financed research.

The question of efficiency merits particular attention in the major research organisations. Their very size will come under critical scrutiny with the constantly changing circumstances of science and research. The large research establishments should quite particularly look for ways of "slimming down" their research. The BMFT is also backing this up with pilot schemes to improve the flexibility of financial and personnel management in the major research establishments. Much has already been achieved here in recent years.

The process of restructuring that has already begun in the major research establishments in the old laender will continue. Between 1992 and 1995 the number of funded establishment posts will be cut by as many as 1800.

Large-scale research will not be the only sector confronted with the issue of efficiency. Germany's other research establishments will also have to tackle the relationship between the input of funds and results or objectives.

## 2. Converting Research Findings

Germany's achievements in basic research should more than hitherto lead to a technological advance which will bring competitive advantages on markets. The BMFT sees this as an essential criterion of efficiency.

Where science and research receive a large amount of public funding, there is always the question of to what extent new knowledge and new technologies can be translated into specific products and processes serving the community and the common good. This does not mean that every project in basic research and areas of the humanities in particular should lead to specific products. But the generous support that Germany gives to basic research is possible only against a background of economic success with technology-intensive products.

An important criterion for research efficiency is the ability to translate the results of applications-related research into specific, salable, and profitable products and processes.

There are a number of examples suggesting that the Japanese in particular are ahead of us in this. Germany will only be in the lead technologically and economically at the start of the 21st century if German science and industry manage to join forces for greater innovation.

The interfaces between research and industry must be improved and cooperation initiated or intensified. Research centers should tackle such questions as flexibility of content, hiving off, commercialization, or forward institutes. This must not jeopardize the long term tasks that are to the fore in the work of major research establishments.

We should be more imaginative in optimizing the transition from public research to application in suitable cases and produce a few examples of feasibility as soon as possible.

At the BMFT's instigation a team of four high level research managers from industry together with the Board Chairman of two selected major research establishments is therefore seeking to identify and appraise potential areas for technological cooperation between the two research centers and enterprises. The BMFT will have the team's findings by the end of the year and then seek to put operational proposals into practice.

The BMFT has a new measure to enable scientists of various disciplines at universities in the new laender to work together on interdisciplinary research topics in temporary pilot schemes. If the model is a success, such forms of interdisciplinary cooperation could also be introduced in the old laender later on.

Universities need to be more flexible when it comes to cooperation. The BMFT will therefore be starting an initiative to support the introduction of "colleges of innovation" at universities in the new laender.

Germany has the advantage of having a broad base of innovative small and medium-sized firms, which as innovators also use and disseminate new technologies.

In view of the major importance of small and medium-sized firms for Germany's technological competitiveness, the BMFT will be further increasing its support for such firms.

With a continued high level of annual support, the measures will in future be concentrated mainly in three areas:

- Support for small and medium-sized firms in special programs;
- Research and development loans for innovative advances, and
- Support for cooperative research ventures.

The new promotional measure for cooperative research ventures will support ambitious national and international R&D cooperation between small and medium-sized firms. They will open up a broad range of promising innovation strategies for these firms and accelerate the cross-sector conversion of research into marketable products.

## 3. Consistent International Cooperation

Man's advance into space and the exploration of the world of subatomic particles present particular challenges to research. Operations in the macro and microcosmos require efforts beyond the capacity of individual countries and merely regional cooperation. Such efforts are generally looking for findings of fundamental scientific importance that will help to solve problems affecting the future of the entire world community, most especially in the fields of energy supply and the preservation of a natural living conditions.

The common aim of expanding the base of knowledge of natural laws and the enormous resources required, that are beyond the means of individual countries, make it a matter of common sense to pool not only financial resources but also the knowledge already existing internationally, to exploit synergies, avoid duplication, and use the power of the international community of nations.

The BMFT supports the consistent internationalization of research topics of global importance. This means primarily space research, fusion research, and making the large installations used for basic research available to all.

With the ending of the East-West conflict the conditions for a consistent internationalization of space research are more favorable than ever before. Mutual demonstrations of power are giving way to the aim of understanding space as a field for technical and political cooperation and at the same time as a joint undertaking of mankind, thus doing justice to the term "space research."

Earth observation from space has also become a top priority. As regards zero-gravity research and the possibility of manufacturing in space, we have learned from experience so far that a lot of basic research is still needed first. In many cases experiments can also be performed by simpler and cheaper unmanned missions.

Like space research, fusion research, too, is already taking the path of systematic international cooperation. An agreement to prepare an engineering draft for an International Thermonuclear Experimental Reactor (ITER) was signed

jointly by the USA, Japan, Russia and the EC in summer 1992. Other countries will also take part in the development within the four partners' contribution as fusion research becomes further internationalized.

Mastery of nuclear fusion would give all mankind a permanently secure energy supply that was kind to the environment and easy on resources. With the world population continuing to grow and the threat of climate change, the option of controlled nuclear fusion should be opened up by research and development.

As a result of the BMFT's broad long-term strategy, Germany in the 1980's became very well equipped with large plant for the promotion of knowledge-oriented basic research. The construction of BESSY II has been decided for the years ahead. The new facilities must now be intensively used. Universities and research establishments should cooperate closely in this. German institutes are also available for joint use by the international research community.

So far as we can see today it will hardly be possible to make any money available for new large facilities for basic research in Germany in the years ahead. The BMFT will also be urging the utmost economy and greater efficiency with existing international establishments. So far as can be seen today, future large basic research institutes will be conceivable only with broad international cooperation.

### III. Framework Conditions for Research and Technology

#### 1. Laws and Administrative Procedures

Debureaucratization and deregulation are permanent tasks of government research and technology policy. In removing barriers to innovation in the shape of statutory rules and bureaucratic procedures amongst others, the BMFT will in many cases be up against rules that it has not itself been responsible for creating. But improvements to the regulatory framework are often a greater help to innovation than the use of official funds.

A negative example is the Genetic Engineering Law. The bureaucracy associated with this law is partly responsible for the fact that only two genetically modified plants were released in Germany in 1992 compared to 858 in the OECD [Organization For Economic Cooperation and Development] member countries. The cabinet has only recently shown its determination to remove administrative obstacles to innovation by adopting an amendment to the law that will make things a lot easier for genetic engineering research in Germany.

The Research Ministry will in future pay greater attention to avoiding possible hindrances to the innovation process when laws are being prepared (assessment of legal consequences).

The tax treatment of investments in research and development is another important part of the regulatory framework. Germany is the only major industrial nation not to have tax incentives for research and development. The BMFT sees R&D tax incentives as an important local factor in our economy's international competitiveness.

The BMFT intends to develop models for tax incentives for research and introduce them into the consultation process for the Federal Government's company tax reform.

#### 2. Acceptance of Research and New Technologies

A BMFT opinion poll showed that 76 percent of all Germans in East and West are convinced that technological and scientific progress is generally to everyone's advantage. So it looks as though the vast majority of the population are well aware that our country's prosperity and ultimately also personal living standards very much depend on the technological efficiency of Germany as a whole. This is in contrast to the critical attitude often found towards particular technological developments, going so far as belligerent rejection.

The BMFT advocates vigilance where new technological developments are concerned. But it is against hysteria which discredits science and technology and prevents a fruitful debate on the pros and cons of new technologies.

Many new technologies are highly complex and are only really understood and mastered by a small number of experts. Today's technologies also differ from earlier ones in that they are no longer comprehensible in the popular sense, but virtually invisible: One need only mention microelectronics and genetic engineering.

Scientists and technologists are strongly urged to see that what they do is made understandable. The BMFT regards this as a duty towards the public and will also make it a criterion for sponsorship.

We need to reflect on the foundations of our prosperity. In a society that has achieved a high standard of living and that values and wants to protect its achievements and reacts very sensitively to possible threats, innovation requires active and convincing argument. New technologies are no longer "best sellers" with the public. Citizens who as taxpayers help to finance research, who as consumers determine the success of new products, and who as mothers and fathers today by their approval or rejection help to decide on our future prospects must be given comprehensive and appropriate information.

#### 3. Strategic Dialogue

Government, industry and science should in future join forces when it comes to fundamental questions of the future of research and technology policy, so far as possible defining jointly that policy's objectives and sharing the work of achieving them. A targeted debate among science, industry, and the government on upcoming research tasks plays a central role here.

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The BMFT will be holding regular strategic discussions on important matters of research with high level representatives of industry and science in a group of experts.

The Research Ministry will also advance the dialogue with scientists, technologists, businessmen and users of new technologies on strategically important subjects at various levels so as to arrive at common objectives.

A number of such discussions are already under way, such as those on "New Technologies and Competitiveness," "Strategies For Industrial Production," or "Energy Supply Strategies."

The BMFT's goal is to use dialogue to develop visions for Germany's technological future that will enable industry, science, and politics to concentrate their forces and pursue their objectives jointly. The examination of the future must be understood as an ongoing process and established as such.

#### Netherlands: State To Promote Corporate R&D Investments

BR2210114393 Amsterdam RESEARCH PLUS  
RESULTS in Dutch Sep 93 pp 26-27

[Article by Jos van den Broek: "Netherlands Losing Speed in Technology Race"]

[Text] "Investment by Netherlands companies in R&D remains drastically behind that of other technologically advanced nations." So says a concerned Minister Andriessen [economic affairs] in the paper "Know-How in Competition—A Policy View of Technology Management," which he presented to the Second Chamber on 21 June

1993. "If we want a higher standard of living, a cleaner environment, and growing job opportunities, we must drastically intensify the know-how of economic enterprises in the Netherlands." By the autumn, more will be known about tax incentives for R&D.

"If the Netherlands do not give their creative researchers a chance to develop, it will remain second rate. That will, in the end, have negative effects for the economy and the quality of life here." These words of warning from Arthur Kornberg were made during the reading of the paper "Know-How in Competition—A Policy View of Technology Management," which Minister Andriessen presented to the Second Chamber. Kornberg, Nobel Prize winner for physiology in 1959, is one of the most prominent biochemists of our time. We talked together at the breakfast table in the Apollo Hotel in Amsterdam in September 1988. It was astonishing to realize how well informed the American scientist was on the situation in the Netherlands. It was obvious that his Netherlands colleagues had made him aware of their concern. In any case, he had listened carefully. "If your country wants to be viable in the next hundred years, you must make money available for creative research," he said then. "The amounts required are certainly not such that the government needs to be protected from giving them. A company or national research program should invest in projects that could be compared with reforestation: They will only bear fruit years later."

#### Ninth Place

Kornberg's words of five years ago have lost none of their relevance. The Netherlands is busily falling behind in the global technology race. During the period from 1970 to 1990, the national income per head of population in this country remained low in comparison to other EC countries. At the same time, our technological position dropped at a similar rate. While in 1970 only the United States and Switzerland were investing a significantly higher proportion of their gross national product (GNP) in R&D, we now stand at best in ninth place in the global ranking order. Investment by Netherlands companies in R&D fell from around 6 billion Dutch guilders in 1987 to 5.6 billion guilders in 1992. In particular the drop in R&D investment by Philips is to blame. As a percentage of gross national product [GNP], investments dropped from 1.4 percent to a worrying 1 percent, while corporate R&D investments in technologically advanced European nations such as Germany, Sweden, Switzerland, and France is between 1.5 to 2 percent of GNP. In particular, the fact that the research basis in the Netherlands is so small puts us at a disadvantage.

#### Three-Pronged Policy

"The power of competition is the mainstay of our prosperity," states the paper from the Ministry for Economic Affairs. "In order to survive, we must continually ensure that we combine higher productivity with better quality and more custom-made goods. Whether we are talking about cheese or CD players, companies can only secure a good share of the market by keeping to the forefront in the application of new technologies." We can only improve our technological position by intensifying the know-how of our economic activities in the Netherlands. According to Minister Andriessen, that can only be achieved by investing in a climate that is

favorable to high-quality enterprises. "That does not only go for the business world; it applies to the government as well," acknowledged the minister. The minister for economic affairs wants to set up a three-pronged policy; first, by stimulating corporate R&D; second, by strengthening know-how; and, finally, by increasing public support.

### **Tax Incentives**

A high-grade economy requires that substantial increases be made in investment in corporate R&D, education, and improvement of production processes. This is especially important because we have to compete with neighboring countries where this already happens. According to the minister, such investment is primarily the responsibility of the business world. But because the social benefits of R&D stretch far beyond the private sphere, there are reasons for government action in the form of a technology policy. Minister Andriessen admitted that Netherlands government financing of company R&D is very modest when compared to that of other countries, particularly when tax incentives and regional support for R&D are taken into consideration. The minister announced among other things that in the future "a few decisions on fiscal matters" will be made. The 1993 Interim Budget Report had already touched on tax incentives for R&D activities. The employers' organizations had urged this earlier. More will probably be known in the autumn about such a measure, which will, though, probably cost several hundred million.

### **Strengthening Know-How**

The second prong pointing toward a more knowledge-intensive economy is strengthening the know-how infrastructure. The minister feels that research in the physics and engineering sciences must be given a financial incentive, specifically in those areas which are relevant for economic development and the environment. How to do that? Dr. Cees le Pair, director of the Foundation for the Technical Sciences, provided what he himself called a "budgetary neutral" solution: "Give the technical universities 0.5 percent more, and let the other universities give up a 0.33 percent!" The technical universities rather like the idea. Chairman N. de Voogd of the Board of Management for Delft Technical University is one of those who is pleading for extra study time so as to be able to produce better engineers. "Certainly if we look at the current, serious, economic recession, we must ensure a better technical education," he said recently in *DE VOLKSKRANT*. But do other than the science faculties and the technical universities like the idea of such a differentiation? During a meeting of the Association of Collaborating Netherlands Universities (VSNU), the ordinary universities let it be known that they did not agree that the technical universities should receive preferential treatment. The VSNU had already torpedoed a plan of Minister Ritzen in 1991 to give a number of technical studies an extra half year's grant.

### **Increase Public Support**

Despite a great enthusiasm for CD players, fax machines, and camcorders, the Dutch know little about "technology." Few young people choose technical study courses. That will have a dramatic effect in the future. Already by the year 2000, a shortage of 19,000 university and 56,000 college graduates is expected in the science and technical job market.

The success of the two policy prongs already mentioned stands or falls, therefore, with the public support for technological improvement in society. Minister Andriessen thinks that public support can be increased by making clear that technology can help solving a number of social problems.

The government will have to provide examples, with the Ministry of Economic Affairs being the catalyst. Such a policy aimed at improving technology penetration into society could, for example, be conducted in the areas of technology development for senior citizens, the environment, energy, underground transport infrastructure, and the fight against crime.

"A knowledge-intensive society is not only recognizable by a sophisticated industry and a modern services sector," said Minister Andriessen. "The government, too, should use modern technologies to improve the quality of life of its citizens." The minister promised to inform the Chamber further before the end of the year on the progress of the project "Technology and Society," and to tell them which projects he, in cooperation with other departments, intends to develop.

### **R&D Expenditure (Percentage of GNP)**

- Information: 7.8 percent
- Communications: 7.1 percent
- Data communications: 10.8 percent
- Production/materials: 5.7 percent
- Testing and measurements: 13.5 percent
- Environment: 8.6 percent
- Marine: 12 percent
- Biotechnology: 11.4 percent
- Agro-food: 7.8 percent
- Biomedical: 16.6 percent
- Third World: 7.3 percent
- Non-nuclear energy: 9.9 percent
- Nuclear safety: 6.4 percent
- Human resources: 8.1 percent
- Dissemination: 1.9 percent
- Monitoring: 10.4 percent

### **Development of Contacts Between Netherlands and Other European Companies Between 1987 and 1991**

- Netherlands (1991-93): down 7.7 percent
- France (1991-92): up 5.7 percent
- Germany (1989-92): up 9.6 percent
- United Kingdom (1990-94): up 0.7 percent
- Belgium (1990-92): down 2.7 percent
- Sweden (1988-92): up 5.5 percent
- Norway (1991-92): up 11.8 percent
- Switzerland (1988-95): up 12.6 percent

**Italy: Milan, Turin Included in EC S&T Innovation Network**

*MI1410123693 Milan ITALIA OGGI in Italian  
4 Oct 93 p 35*

[Article by Carlo Beltrame: "Hi-Tech Milan and Turin"]

[Text] In the research project conducted as part of the MONITOR-FAST [EC program for strategic analysis, forecasting, and evaluation in research and development-Forecasting and Assessment of Science and Technology] program on behalf of the EC Commission and entitled: "Archipelago Europe: Islands of Innovation," 10 areas of excellence have been selected in relation to three main "technological and scientific fields": artificial intelligence, biotechnology, and the aeronautics and space industry. These areas must fulfill special criteria, such as: allocating more than 20 percent of public spending for research and development in the relevant country, specialization in one of the three aforementioned fields, a large number of research centers and companies in the area, and a node function for the international cooperation network links. The 10 islands of innovation selected in the MONITOR-FAST program are London, the Rotterdam-Amsterdam area of Randstad Holland (the ring of cities in the western Netherlands), Ile de France (the Paris area), the Ruhr area, Frankfurt, Stuttgart, Munich, Grenoble- Lyon, Turin, and Milan. Links have already been or are about to be established between some of these islands, such as for example between Grenoble/Lyon and Tecnocity in Piedmont, Italy. The islands listed represent the innovative heart of EC member countries and the map of (existing or potential) cooperation can be called the "Compostela walks" of modern times. In addition to the network of cooperation between research institutes and companies, more complete forms of cooperation are being established, as well as planning and programming agreements between regional bodies. One example of this is Cotrao and cooperation between the "four motors for Europe." Cotrao is a working community which groups together three Italian regions (Piedmont, Liguria, and the Valle D'Aosta), two regions of France (Provence-Alpes-Cote d'Azur and Rhone-Alpes) and the Swiss cantons stretching from Geneva to the Ticino (through Vaud and Valais). Lombardy, Rhone-Alpes, Catalonia, and Baden Wuerttemberg have been declared the motors of Europe. Although the various regional bodies involved are of varying institutional importance (a German land is one thing, an ordinary Italian region another), there is no doubt that these forms of cooperation provide adequate frameworks for strengthening links between the islands of innovation and also for creating new ones.

This particular EC research project rightly places considerable emphasis on the cooperation networks (obviously not only between islands of innovation) and on the need, more greatly felt in the regions of Europe, for networking, i.e., working daily within a network. The research ends with a set of "policy recommendations" (intended above all for the EC Commission). This proves that new islands can be created (not too many however: Over-extensive distribution could weaken the capacity for innovation in Europe as a whole), and above all that connections and links with the regions and areas not directly related to the islands should be developed. Focus should then be turned to innovative specialization (so that the various areas can make their

original contribution to the European archipelago of innovation) and it must not be forgotten that advanced technology is not the only road to innovation and economic growth. Intelligent decisions and a suitable basis are in fact fundamental for high quality of life, and since a specialist labor force is the main source of innovation, training, and education policies are of paramount importance. The EC research project concludes by stating that regional innovative creativity is not based only on advanced industrial and research structures, but above all relates to the capacity for renewal and for industrial modernization.

**CORPORATE ALLIANCES**

**Belgian Machine-Tool Firm Strengthens Base**

*Paris PRODUCTIQUE/AFFAIRES in French  
20 Sep 93 pp 4, 5*

[Unsigned article: "Dismantling of Brisard to Benefit the Belgian Haco"]

[Text] The lean times inflicted on the Brisard group by SFPI are continuing since the takeover last February. Some 10 subsidiaries of the former French machine-tool leader have been placed under court custody and some of them liquidated. Among companies specializing in metal removal, the group headed by Henri Morel has filed for bankruptcy for Ramo (Niort), followed by Muller & Pesant (Maubeuge), both of them now in liquidation. In metal forming, Presses de Remiremont has also felt the purge but was able to avoid liquidation through buyout. In wood processing machinery, Guilliet, Fonderie Auxerroise, JCL, Brisard Machines Bois, Vigneau, Chambon and INCA have been excluded from the group's peripheral activities. Brisard Machines Bois, which had been formed by Rene Brisard after the acquisitions of Bertrand Garcin, Vigneau and Socolest in 1989 to be their commercial and engineering structure, is under court order for bankruptcy. Fonderie Auxerroise has met the same fate. On the other hand, INCA International was bought by Compagnie Europeenne de Fonderie (specialized in tooling), who kept 25 of the former 54 employees while the Commercial Court in Vesoul entrusted Vigneau to the Alsatian enterprise Esterer. But the Belgian group Haco, specialized in presses, is the main beneficiary of the Brisard dismantling and is strengthening its position in wood processing machinery. Operating in France near Lille for the past twenty years or so, Haco, which also owns a sales network for wood processing machinery, had started to diversify in the fabrication of this type of equipment in 1991 when it took over TNS in Dieppe. Now, the Belgian company is taking over the Chambon enterprise in the Jura, as well as Guilliet (Auxerre), and JCL (trading arm of the other two). In fact Haco is taking its revenge on the Brisard group: In 1990, the Belgian company had lost Guilliet to Brisard and had had to settle for TSN which was part of the same group as the Auxerre enterprise. Above all, Haco is taking control of two companies restored to health: the staff at Guilliet has been cut in half (75 salaried employees remain), while the Chambon staff has dropped from 70 to 45. It is true that these two companies, which together had a business volume of about 250 MF three years ago, will probably see this figure settle between 85 and 100 MF this year. While preserving the three company names, the three French production sites should, according to the directors, now



specialize by types of products in order to maximize production. It should be noted that a new wave of job eliminations has been announced in the former Brisard group. The machine-tool companies are in a tough spot: 75 jobs are expected to be eliminated (out of 248 at the end of 1992) at Forest Line in Capdenac, and 63 more (out of 163) at Albert in the Somme. The Berthier company (Saint Etienne) is thought to be also affected, but the Clement company in the Paris region is not.

#### **France: Sextant Avionique Considers Merger With U.S. Allied Signal**

*BR1410150793 Paris LA LETTRE DU GIFAS  
in English 9 Sep 93 p 2*

[Unattributed article: "Thomson-CSF Ups Its Stake in Sextant Avionique, Now Working on a Project for a Joint Venture With Allied Signal"]

[Text] After demonstrating its ability to rival European American competitors while developing and mastering the most advanced technologies, Sextant Avionique is going through hard times, primarily caused by the general economic slump, the catastrophic situation of the carrier trade, and a drop in military orders. The firm's revenues dropped by 2 percent in 1992, resulting in layoff plans because of the drop in orders. With regard to avionics activities, a plan for a joint venture with the American firm Allied Signal is now being studied. The idea is to give Sextant Avionique needed funding for development. It would entail far-reaching changes in the operation of the firm and it is not expected that dividends, which have not been paid for the past two years, will be resumed in the foreseeable future. For this reason, Thomson-CSF and Aerospatiale, acting through the holding company ATEV (Aerospatiale Thomson Flight Electronics) have decided to offer to buy out small shareholders by offering them 300 French francs per share. If this action brings ATEV holdings beyond 95 percent in Sextant Avionique's capital, ATEV will ask stock market authorities to remove the name Sextant Avionique from official listings. The operation would be financed by increasing the declared capital of Thomson-CSF and Aerospatiale. Once the operation is concluded, ATEV share allotment will be: Thomson-CSF 66.6 percent and Aerospatiale 33.4 percent. The decision by Thomson-CSF to take over Sextant Avionique is due to the similarity of activities and complementarity of operations between Sextant Avionique and Thomson-CSF in the field of professional electronics. Sextant would then cease to be considered as a European aeronautical manufacturer and gain better access to American avionics markets. While the offer was made to small shareholders to acquire their stocks while changing the control structure, Sextant Avionique announced that it was examining a project together with Allied Signal for forming a joint avionics venture. This would include most of the civil avionics activities of Allied Signal (together with the activities of Sundstrand Data Control recently acquired by Allied Signal) and the greater part of civil and military avionics activities of Sextant Avionique. If the project becomes reality, as the two firms hope, before the year is out, the venture would generate an annual revenue of around \$1 billion and would be the world's second most powerful venture in electronics applied to flight, following Honeywell. For more information, contact Thomson-CSF, Communications Service—Phone: +33-49-07-82-61.

#### **Effect of DASA's Acquisition of Fokker on Regional Aircraft Market**

*93WS0674 Bonn LUFT- UND RAUMFAHRT  
in German May/Jun 93 pp 18-22*

[Article by unidentified author: "DASA-Fokker: Alliance for Europe" first paragraph is LUFT- UND RAUMFAHRT introduction]

[TEXT] The majority takeover of Fokker by Deutsche Aerospace (DASA) is an important part of the restructuring of the European aircraft industry. It represents the first step in the integration of the regional aircraft market, a process which may in the future encompass additional aircraft firms.

It has been more than a decade since the regional aircraft market began to grow at such a rapid pace that many aircraft manufacturers in Europe and North and South America decided to pursue the development of new types of modern aircraft. However, despite the increased demand, the large number of competitors ensured that individual product lines were economically feasible only if they included a wide range of models.

This less-than-satisfactory situation led DASA, which is represented in the regional market by the Dornier 228 (19-seater) and the Dornier 328 (30-seater), to conclude some time ago that a comprehensive system of European cooperation in this market was essential. The original plan was to establish a system of cooperation with Aerospatiale and Alenia, which cover the 40 to 70-seater market with their ATR line. The idea was to jointly market existing families of aircraft and begin development of the DA92/122 regional liner for 80 to 130 passengers.

In early 1992, however, these plans were temporarily shelved. Instead, DASA decided to begin negotiating the majority takeover of the Dutch aircraft firm Fokker. In this manner, DASA hoped to acquire, within a short period of time, both an aircraft line that had been established over decades and a reliable marketing and service system. The acquisition of the Fokker regional jets (the 70-seater Fokker 70 and the 100-seater Fokker 100) together with the 50-seater Fokker 50 will enhance the Dornier line, giving DASA a broad-based regional line with models ranging from 19-seaters to 100-seaters.

The negotiations with the Dutch government, the principal stockholder of Fokker, proved very lengthy, and it was not until 27 April 1993, after more than a year of negotiations, that the contract for the majority takeover was signed in Der Haag.

DASA has made it quite clear that it does not consider the acquisition of Fokker to be the ultimate solution to the question of the concentration of regional aircraft capacities in Europe. It would like both Aerospatiale and Alenia to buy into the Fokker holding. However, even should these two firms indicate an interest in such a partnership, it still remains to be seen whether the EC Commission will approve such a concentration of competition. The aircraft industry maintains that the standard used to evaluate the degree of competition should be the world market, not the European market. From this perspective, the merging of the Dornier, Fokker, and ATR lines would in no way constitute a market-dominating situation.

There are also important decisions still to be made concerning the further development of the aircraft lines. Studies have already been conducted on a stretched version of the Dornier 328 which would accommodate up to 50 seats. However, this Dornier 328S would be in competition with the Fokker 50, and, should the ATR line be added, with the ATR42 as well. At the same time, Fokker plans to turn the Fokker 50 into the stretched Fokker 60, while ATR is looking into the possibility of stretching the 70-seater ATR72 even further, to accommodate 80 seats. The resulting ATR82 (equipped with either a turboprop or turbofan engines) would, in turn, be in direct competition with the Fokker 70, which was officially launched at the Paris Aerosalon in June 1993.

It is becoming apparent that even should strategic alliances be made for the long-term development of joint aircraft lines, the competition between existing and planned families of aircraft represents a significant obstacle to the rapid conclusion of agreements.

The partners will also have to decide within the next few years which project DASA and Fokker (and possibly Aerospatiale and Alenia) will use to expand their line to include 130-seaters. As part of the majority takeover, DASA conceded to Fokker the role of leading partner in the area of 65 to 130-seater regional jets. However, the long-awaited launch of the Fokker 130 depends to a great extent on how the market in this sector develops. After all, Airbus Industrie also launched a new model at the Paris Aerosalon: the 124-seater A319, a shortened version of the A320. The A319 will naturally be of interest to those customers who already have the A320 and the A321 in their fleet and would like to take advantage of the resulting commonalities. A regional aircraft in the 130-seater class, on the other hand, could be the model of choice for smaller airlines interested in expanding their fleet from the bottom up. DASA expects that the market overlap will only affect approximately 10 percent of the total market in this class.

It is unclear, however, whether a new line of aircraft should be developed based on the Fokker 130. Although the development costs would be relatively low, new technologies could be applied in only a very limited manner. Consequently, parallel to the work being done on the Fokker 130, studies are also being conducted on an entirely new regional aircraft with an 80-130-seat capacity. These studies are based on earlier work for the DA92/122 regional liner. Current thought, however, holds that it will not be possible to complete this aircraft until after the turn of the century. The 130 could therefore serve as a temporary means of ensuring a continued market share.

Whatever form DASA's strategic planning may take, it is nonetheless certain that its takeover of Fokker will result in a new line-up within the European aircraft industry, one which will greatly influence future structural changes within the industry.

Ties between the German aircraft industry and Fokker are not altogether new. The Dutch aircraft pioneer Anthony Fokker built his first airplanes in Germany in 1911 and his first plant in Berlin-Johannisthal in 1912. The plant was

later moved to Schwerin, and during World War I it became the largest aircraft plant in Germany.

It was only after the 1919 Treaty of Versailles, when aircraft manufacturing in Germany was severely restricted, that Anthony Fokker moved his entire enterprise to Amsterdam and founded a new, Dutch, firm. Over the next few years, the firm developed several extremely successful models of passenger airplanes that served as the foundation for the fleets of many (then) new airlines. In the mid thirties, however, Fokker fell behind the times technologically when he delayed switching to the more modern all-metal construction.

Fokker reentered the market in 1955 with the twin-engine Fokker F-27 "Friendship," the basic design of which is still used, in its modern form, for the Fokker 50. After well over 900 orders, the F-27/Fokker 50 series is by far the most successful turboprop.

The short-haul jet F-28 "Fellowship," which has been built since 1967, also lives on in today's Fokker 100 and Fokker 70. Well over 500 of this series have been sold.

The former Amalgamated Aviation Engineering Plants (VFW), later Messerschmitt-Boelkow-Blohm (MBB) and now German Aerospace Airbus, has engaged in cooperative efforts with Fokker for many years. Consequently, DASA has a 27 percent interest in the Fokker 100 line and a comparable interest in the new Fokker 70.

In early 1970, VFW and Fokker founded the first transnational VFW-Fokker firm. However, this attempt to stimulate European integration within the aeronautical and aerospace industry failed ten years later. VFW was subsequently taken over by MBB.

The new partnership between DASA (as the successor to MBB) and Fokker has been launched under entirely different circumstances. This time, it is not merely a loose cooperation under the roof of a "central association," such as that which in 1970 served to hold the two firms together, but a majority takeover of Fokker by DASA carried out in accordance with corporate law. Consequently, this new alliance between the German and Dutch aircraft industries appears to have a much greater chance of succeeding.

## CORPORATE STRATEGIES

### SNPE 1992 Annual Report

93WS0716A Paris *RAPPORT ANNUEL* in French 1992 pp 1-39, 1-15

[1992 Rapport Annuel, appendices to consolidated accounts not included]

[Excerpt]

### Board of Directors of the SNPE

#### PRESIDENT

Emile Blanc

#### ADMINISTRATORS REPRESENTING THE STATE

Defense Ministry and General Weapons Delegation

Thierry Klinger, Director of Personnel and General Weapons Affairs  
Pierre Deguest, Subdirector of the Central Department for Industrial Weapons Affairs

**Ministry of the Economy**

Paul Champsaur, General Director of INSEE (National Institute of Statistics and Economic Studies) Brigitte Molkhou, Treasury Division

**Ministry of Industry**

Alain Pesson, General Industry Division, Chemistry Subdivision

**ADMINISTRATOR REPRESENTING SHAREHOLDERS**

Max Tual, Societe Generale

**QUALIFIED ADMINISTRATORS**

Pierre Betin, SEP (European Propellant Co.) Pierre Chiquet, GIAT Industries Thierry Coste, Credit Agricole Jean-Daniel Levi, CNES (National Center for Scientific Research) Rene Sautier, Sanofi

**ADMINISTRATORS REPRESENTING EMPLOYEES**

Jean-Pierre Comte Marie-Claire Carmagnac Jackie Lamic Gerard Michaelis Gerard Vidaud Carol Waligorski

**WORKER-MANAGEMENT COMMITTEE DELEGATE**

Pierre Verdery

**EXECUTIVE COMMITTEE**

Emile Blanc, Chairman of the Board Jean Faure, Delegate Chief Executive Officer Daniel Doyen, Central Division of Human Resources and Social Relations Pierre Dumas, Director of Industrial Head Office Michel Philippe, Central Finances, Management Division Bernard Riviere, Director of Commercial Head Office

**GOVERNMENT EXPERT IN ADMINISTRATIVE LAW**

General Armand Wautrin, General Armed Forces Controller, Defense Ministry

**AUDIT BOARD**

Gilbert Rastoin, Head of the Economic and Financial Audit Board for the chemical companies Claude Belmont, State Auditor

**INDEPENDENT AUDITORS**

Frinault Fiduciaire Consultaudit

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SNPE Across Five Continents

SNPE Group Markets

**A Word from the President**

1992 was a difficult year for SNPE Company and Group. The Group's net losses of 67 million French francs [Fr] and sales of Fr4.213 billion reflect the structural crisis affecting the weapons industry and the severe recession devastating chemicals and materials. The world's geopolitical shifts have caused a rapid and steady decline in national orders for military weapons, and a sudden, severe drop in weapons export orders. This structural trend is not likely to reverse itself in the medium term, and may even worsen. Projected munitions orders between 1988 and 1994, for example, are down by two-thirds. Sales of military products over the same period will total only half the amount forecast.

This situation demands further revamping of SNPE's production capabilities. Most important, however, it forces the Group to step up diversification into every industry in which it is now active on the basis of its special expertise. SNPE will continue to invest heavily to lay the groundwork for its future: the Group's 1993 budget calls for Fr42 million in equipment and non-equipment investment. In 1992, similar outlays came to Fr580 million.

SNPE shareholders have encouraged this expanded diversification into non-military products by raising the Company's equity Fr300 million, to Fr1,400 million.

The Group's increased capacity for permanent financial commitments will enable SNPE, which is a leader in certain niches and which has thus far always financed its diversification into new markets through its own resources, to stay in the high-technology race. It is the ability to develop and use cutting-edge technology that leads to new, stable, and productive markets. SNPE will be helped significantly in that task by the Bouchet Research Center.

The financial contribution of our shareholders shows that they agree with and support SNPE's strategy. Their decision is an encouragement to forge ahead in pursuing economically rational industrial development. Such development is where SNPE will channel its efforts, and find its future success.

Over the next few years, SNPE will uphold its strategy of developing as many diversified products as possible, generating the maximum number of jobs, at each site. It will do this through its own resources or by teaming up with other manufacturers.

In Sorgues, for instance, SNPE Group, which is already associated with Shell Chemicals France, will probably team up shortly with a Japanese partner. In Bergerac, SNPE created a subsidiary to produce nitrocelluloses with the Italian group BPD. The firm is the top European producer and second-ranking international maker of nitrocellulose. In Pont-de-Buis, we are developing a facility specializing in pyrotechnical devices for automobile safety with Autoliv Klippan of the Swedish group Electrolux.

The issue of restructuring Europe's weapons industry has become critical.

SNPE intends not only to take part in doing so, but to be an energetic and imaginative driving force: yet another way to utilize our assets and safeguard our jobs.



The Group will also remain active in its areas of expertise that offer promising new product niches, such as counter-measures, insensitive munitions, and reactive armoring.

SNPE has teamed up with Aerospatiale to create CELERG, a company that will be at the heart of Europe's future tactical-missile engine industry.

SNPE is broadening its field of action as much as possible. The Group now covers the entire world, and recently made a significant breakthrough in Japan. Its SNPE JAPAN subsidiary expects to rack up sales of Fr110 million in 1993, almost double its turnover two years ago.

In April, SNPE signed an agreement to create a subsidiary with the Hungarian group Borsodchem in Budapest. The Franco-Hungarian joint venture, in which SNPE holds a 60 percent share, works on synthesis intermediates used to manufacture pharmaceuticals, agrichemicals and plastics. Its creation illustrates the fact that an original approach to foreign partnerships can utilize the expertise of both partners to good advantage and double the potential for market penetration.

Constantly pushing ahead based on the Group's expertise, while incorporating the different cultures of our manufacturing partners, is still an SNPE Group goal. It is also a challenge. In diversifying into non-military markets, SNPE has its eye on the whole world.

Emile Blanc, Chairman of the Board

#### Key Figures: Graph Information

SNPE Group sales of Fr4,213 million break down by industry as follows: Defense & Space, Fr1,969 million, or 46.7 percent; Chemicals, Fr1,405 million, or 33.4 percent; Materials, Fr791 million, or 18.8 percent; and Various, Fr48 million, or 1.1 percent.

The geographical breakdown of sales is 61.5 percent, or Fr2,591 million in France; 27.9 percent, or Fr1,175 million, from exports; and 10.6 percent, or Fr447 million, from foreign companies.

Sales in 1990 were Fr3,959 million, compared to Fr4,758 million in 1991, and Fr4,213 million in 1992. Added value figures were Fr2,067 million in 1990, Fr2,186 million in 1991, and Fr1,903 million in 1992. SNPE staff totaled 6,877 in 1990, 7,285 in 1991, and 6,483 in 1992. Total salary expenditures came to Fr1,420 million in 1990, Fr1,617 million in 1991, and Fr1,573 million in 1992. Investment in tangibles totaled Fr359 million in 1990, Fr357 million in 1991, and Fr496 million in 1992. The Group's cash flow was Fr347 million in 1990, Fr110 million in 1991, and Fr230 million in 1992. It carried debt of Fr945 million in 1990, Fr1,473 million in 1991, and Fr1,910 in 1992. SNPE posted net profits of Fr75 million in 1990, net losses of Fr127 million in 1991, and net losses of Fr67 million in 1992. Its operating margin was Fr685 million in 1990, Fr631 million in 1991, and Fr469 million in 1992.

#### SNPE Group: A Tight Management Structure to Meet the Challenges of the Future

Organizational Chart - \* Executive Committee + Board of Management

Office of the President: Chairman of the Board, Emile Blanc \* +;

Delegate Chief Executive Officer, Jean Faure \* +

Divisions accountable to Emile Blanc: Director of Commercial Head Office, B. Riviere \* +; Central Finances and Management Division, M. Philippe \* +; Director of Industrial Head Office, P. Dumas \* +; Central Division of Human Resources and Social Relations, D. Doyen \* +

Divisions accountable to Jean Faure: General Auditing, P. Le Roy +; Strategy and Planning Division, A. Brocart, +; International Relations Division, M. Thevenin +; Communications Division, M. Bidaud +

Accountable directly to office of the President: General Delegate for North America, B. Zeller; Space & Defense Division, M. Nicolas +; Chemicals Division, J.-P. Hufschmitt +; Materials Division, B. Hueber +; Bouchet Research Center, B. Wiedemann

The new management organization established in 1992 is part of SNPE's strategy for meeting the industrial, technological, and commercial challenges of tomorrow.

The Group remains organized around three Divisions: Defense & Space, Chemicals, and Materials. The Divisions themselves are divided into Operations Departments and specialized subsidiaries.

Four central positions accountable to the Office of the President were created, to strengthen, unify, and constantly improve the coordination of SNPE Group's commercial, industrial, financial, and human resource components.

In an industrial and commercial context that has become even more demanding, thanks largely to the recession that has gripped all the Group's industries, such restructuring had become imperative.

The new positions were given to staffpeople recognized for their great expertise both within and without SNPE Group. They sit on the Executive Committee responsible for assisting the President in drafting the Group's strategy. The Executive Committee and the four functional Directors—Communication, Strategy & Planning, International Relations, and General Auditing—participate in the Board of Management that runs SNPE.

SNPE Group thus has the structure it needs to combine the future with the present, and prepare for tomorrow on a daily basis.

#### The Defense & Space Division

##### Organizational Chart

Head: Michel Nicolas

Directly accountable to Michel Nicolas: Propulsion, F. Mercadal; Powders and Explosives, J. Cardin; Survivability, A. Freche; Demilitarization, B. Brouqueyre; Pyrotechnics, H. Zante; Technology & Research, A. Davenas

Facility heads, directly accountable to Nicolas: Angouleme, J. Salmon; Bergerac, R. Meyniel; Saint-Medard, J.-J. Gautier



Main manufacturing subsidiaries, directly accountable to Nicolas, followed by percentage of SNPE ownership: CELERG, 50 percent; REGULUS, 34 percent; PB CLERMONT, 100 percent; AEMC, 50 percent; INEXCO, 50 percent; PYROMECA, 92.2 percent

Against a backdrop of rising competition, Defense Division business declined again in 1992. Budget decisions both in France and abroad—and especially in Europe—led to reduced orders and even program cancellations. Negative growth is affecting both production and development programs for the Strategic Nuclear Force (Hades, M4) and for tactical missile or rocket (MLRS) and conventional munitions (155 mm).

Competition for exports has intensified. American manufacturers are benefiting from the effect of the Gulf War and the unreserved support of their government. European manufacturers, who are facing the same difficulties in their own countries and who, in many cases, have the advantage of currencies that have devalued significantly in relation to the French franc, stepped up their pressure on SNPE's traditional markets.

Michel Nicolas's Defense & Space Division is constantly adapting its organization to this new political-economic situation. In 1992, the management of several businesses was merged into one Department. Strategic, tactical, and space propulsion were combined into the Propulsion Department, while activities relating to powders, fuel inserts, and basic explosives for munitions were fused into the Powders and Explosives Department. Two new departments were created to promote the development of emerging niches.

One, the Survivability Department, focuses on devices (reactive armoring, countermeasures, composite explosives that reduce the sensitivity of munitions) to protect combat platforms.

The other, the Demilitarization Department, aims to destroy munitions and their components. Efforts to promote collaboration and alliances with French and foreign companies in 1992 gave rise to CELERG, a joint Aerospatiale - SNPE subsidiary working in tactical propulsion. The Division also signed a basic agreement to create a EURO-COMPOSITES consortium with DASA (MBB) to produce insensitive explosive loadings for undersea munitions, and began collaborating with GIAT on demilitarization.

Staff: 3,135 Sales: Fr1,969 million Added value: Fr939 million Operating margin: Fr225 million

#### Defense & Space Division Departments

##### Propulsion - Francis Mercadal

SNPE is one of the Western world's most important designers and makers of propulsion subassemblies. The Propulsion Department headed by Francis Mercadal is responsible for developing, producing, and marketing solid-propellant loadings for tactical, strategic, and pre-strategic missiles and space launchers, and for producing engines for NATO (MLRS, HAWK) and export markets (artillery rockets).

Such work requires total mastery of loading and engine design and of how the loading or engine interfaces with the

system. Engineers must control quality, operational safety, and the pyrotechnical behavior of the system in its environment perfectly.

SNPE maintains close ties with the principal French and foreign propulsion companies, including:

—SEP, via the G2P consortium for FNS strategic missiles;—the Italian firm BPD, with whom it develops Ariane 5's solid-propellant motors and produces the motors' propellant at the Guyana factory via their joint subsidiary REGULUS;—and Aerospatiale, through their joint subsidiary for tactical missile, cruise, and rocket motors, CELERG.

The Department's current line of solid propellant loadings is one of the broadest in the world in terms of size, applications, and performance. Modifications in progress involve performance, low signature, vulnerability reduction, and reduction of environmental impacts. They will enable SNPE to stay on the industry's cutting edge.

1992 was an eventful year in the development of certain activities. The successful acceptance firing of the M4 from a missile-launching nuclear submarine (SNLE) confirms the reliability of big powerplants, which are continuing their winning streak. In November, 1992, the decision to launch the new M5 missile program kicked off development of its first stage. In addition, the Department undertook the first preseries loadings to equip the Eurobag gas generator, thus completing development of that essential component. The first active mixes and castings in Kourou of the B1 demonstrator loading for the Ariane 5 booster was a first step in getting all REGULUS subsidiary facilities up and running.

##### Powders and Explosives - Jacques Cardin

SNPE Group is Europe's top company in its basic business, and is the only one to offer a complete line of powders, fuel inserts, and explosives for the loading of conventional munitions.

The Powders and Explosives Department, headed by Jacques Cardin, designs, develops, and markets all military powders and explosives produced by SNPE Facilities and Belgian subsidiary PB CLERMONT.

The Department's line runs from black powder—irreplaceable in ignition devices—to the most powerful propulsive powders for tank (120 Leclerc) or artillery (155 AUFI and 155 ERFB) gun large-caliber munitions.

The competitiveness of single-base powders has prompted R&D staff to boost their performances as far as possible.

PB CLERMONT now has an efficient, reliable industrial tool with its new nitroglycerine plant, inaugurated in early 1992, and its modernized spherical powder finishing shop. The subsidiary's investments show its desire to expand the market for spherical powders, which unarguably offer the best performance/price tradeoff for small- and medium-caliber munitions.

The Department pursued efforts to improve the productivity of extruded powder manufacturing, installing new, continuous mixers-extruders. The equipment is either up and running or being used experimentally at the Saint-Medard, Angoulême, and Bergerac facilities. Together, SNPE and PB CLERMONT powder lines satisfy all known

Western needs for fuel inserts for large-caliber propellant loads (120 tanks and 155 artillery).

Besides explosives and basic compositions, SNPE is offering new, reduced-sensitivity, safer-operating explosives such as ONTA (oxynitrotriazole) and TATB (triaminotrinitrobenzene).

Reduced-sensitivity, higher-performance powders are vital components in insensitive munitions (IM), and constitute a future niche for development. Significant strides in the processes used to manufacture these new-generation powders were made in 1992.

#### **Survivability - Alain Freche**

Over the last several years, the survivability of combat platforms such as tanks, airplanes, and ships has become a major concern of Western army general staffs, both from the standpoint of saving lives and money. To satisfy the growing demand, the Survivability Department headed by Alain Freche is developing and marketing three lines of new products.

#### **Decoys and Countermeasures**

SNPE Group has made equipment to assist in the ultrared guidance of missiles for over 20 years. Today it is expanding its countermeasures activities by demonstrating its competence and know-how in the design, dimensioning, and manufacture of first-generation decoys.

The arrival of air-to-air and surface-to-air missiles equipped with multimode infrared sensors has spurred SNPE to exploit its technological capabilities to develop second-generation, self-propelled, multispectral-emitting decoys. The new decoys outclass conventional, first-generation ones employing infrared or electromagnetic waves.

SNPE is also marketing a line of products earmarked for "ground" weapons systems. They include smoke-generating munitions, infrared masking devices, and multithreat munitions (infrared and electromagnetic).

#### **Reactive Armoring**

To protect ground combat platforms, SNPE has developed and is marketing a complete line of reactive armoring that employs low-sensitivity and adjustable-reactivity energy materials. Such reactive armor can be adapted to provide extra protection for both heavy and light armored vehicles. The reactive armoring designed by SNPE is effective against hollow charge attacks and insensitive to classic battlefield shocks and impacts such as bullets or fragments. It does not cause collateral damage. A round of tests conducted in 1992 and involving two other competitors (Israeli and American) showed that the reactive armoring developed by SNPE was more effective. The promotion and marketing of SNPE reactive armoring is handled by AEMC US and AEMC Europe (SNPE/KAMAN joint venture).

#### **Composite Explosives**

To improve detonation while reducing sensitivity to environmental aggressions, SNPE is proposing the integration of composite explosives, whose main feature is their very high degree of intrinsic immunity, into munitions. Designed and

developed by SNPE, the explosives are produced by incorporating loads of explosive substances into a polymerizable binder that can itself be made energetic.

This new, still-developing generation of explosives has already been integrated into many missile heads and operational marine warheads.

Feasibility tests of composite explosive military warheads for antitank missiles produced excellent results, notably in terms of penetration levels.

In 1992, the Department conclusively demonstrated the value of bicomposition explosive loading for desensitizing big munitions such as airplane bombs.

To promote and produce composite explosives, SNPE Group has resolutely set about developing and manufacturing them, and has a broad range of means for doing so at its Sorgues facility. Moreover, to better meet specific needs or serve certain markets, SNPE is relying on extremely flexible and diversified arrangements, which run from strong contracts with such manufacturers as Marconi Underwater for Stonefish mines, to more structured relationships with munitions manufacturers. The latter include:

- the SNPE/OTO (CSO) consortium with Oto Melara;
- the INEXCO subsidiary with Thomson Brandt Armesments;
- and the EUROCOMPOSITES consortium with DASA. In addition, SNPE has a special partnership arrangement with GIAT Industries.

#### **Demilitarization - Bernard Brouqueyre**

A market study done in 1991 revealed a very strong, rapidly emerging demand for services to destroy munitions, missiles, or sensitive components made obsolescent or superfluous by reductions in armed forces. In 1992, SNPE asked Bernard Brouqueyre to create and develop the Demilitarization Department. The new demand for demilitarization is linked to the fall of the Berlin Wall and the disappearance of a potential, major East-West conflict in Europe. It is also the result of increasingly stringent safety, environmental, and waste-destruction regulations. SNPE's Demilitarization Department is developing recycling and destruction activities for all types of munitions (for barrel weapon, bombs, mines, etc.) and missile engines, in accordance with the strictest safety and environmental standards.

SNPE's experience in destroying waste generated by the manufacture of explosives, powders, and propellants gives it the background to market its know-how in destroying sensitive military products in France and Europe. For instance, SNPE has been operating a plant to regenerate cotton powder from declassified powders for over 10 years at its Angoulême facility. Compared to the traditional method of destruction by burning, the technique can recycle over 85 percent of the material, and eliminates all combustion product emissions.

The Department plans to start collaborating with GIAT Industries, to pool complementary expertise, and offer a more complete service.

**Pyrotechnics - Hubert Zante**

The activities of the Pyrotechnics Department have devolved entirely to PYROMECA, a subsidiary that has been installed in its new Toulon Lagoubran quarters since 1992. PYROMECA is headed by Hubert Zante, who also directs the Department.

The Pyrotechnics Department aims to promote the use of pyrotechnical substances as a source of autonomous energy that can remotely or automatically activate mechanisms over a very short and reproducible reaction time.

Using SNPE's very broad repertoire of explosive and propulsive substances, pyrotechnicians must reconcile the use of energy substances, their incorporation into precision mechanisms, and perfect control of safety and reliability. PYROMECA is currently Europe's leading expert in pyrotechnical applications, and a top-notch specialist in mechanics and detonation science. The subsidiary has developed over 2,500 different pyrotechnical devices. They range from basic components such as cutting or transmission detonating fuses, and pyromechanisms such as explosive bolts, ultra-rapid valves, thrusters, and selectors, to complex systems for the ejection of submunitions or the recovery of submerged objects. Although varied, these systems all have one thing in common: They are high-added value products manufactured in small runs.

The primary markets for pyrotechnical devices are defense, space, extreme working environments—offshore, nuclear—and the protection of installations and people.

**Technology & Research - Alain Davenas**

The most important achievements of Alain Davenas's Technology & Research Department in 1992 involved numerical simulation, the development of efficient manufacturing processes, and continued "desensitization" of the Group's munitions.

In the field of numerical simulation, progress was made in mechanical dimensioning and the prediction of unsteady phenomena that occur during powerplant operation. The installation of a network of stations considerably boosted the computing power of the Bouchet Research Center: increasing the capacity of a CONVEX supercomputer did the same for the Saint-Medard facility. These advances were confirmed by an initial, successful application on an experimental Ariane 5 booster mockup. In the area of manufacturing processes, researchers conducted a scale-1 demonstration of how single-base powders with the desired ballistic characteristics could be produced using continuous extrusion. They also successfully conducted an initial experiment involving the continuous production of composite propellant.

Studies to "desensitize" munitions enabled staff to develop a low-vulnerability composition for airplane rockets, and to demonstrate that SNPE composite powders in munitions configuration can indeed achieve IM specifications (i.e., they do not detonate when hit by bullets or hollow charges). Moreover, Departmental research produced low-signature propellants that do not detonate on impact. In 1992, the Research & Technology Department successfully demonstrated a new, reduced-environmental-impact propellant formulation (reduced hydrogen chloride gas ratio) for space

launchers. It developed a new propellant for ballistic-missile-spacing systems that features a substantially higher specific impulse. SNPE signed additional agreements on new energy molecules with the American firm Rockwell, thereby broadening its cooperation with that company. At the same time, the Bouchet Research Center made its first kilo of a brand new, high-performance energy compound, CL20.

**The Defense & Space Division's Principal Subsidiaries****Propulsion**

CELERG 381 avenue du General de Gaulle 92140 CLAMART Phone: (16) 1 41 07 82 82 SNPE Group ownership: 50 percent Capital: Fr130.2 million Businesses: study and sale of propulsion systems for all kinds of missiles, rockets, and other tactical or cruise craft.

REGULUS Guyana Space Center BP 73 - 97373 KOUROU Cedex - Guyana Ownership: 34 percent Capital: Fr4 million Businesses: the development and production in Guyana of Ariane 5 boosters in partnership with BPD.

**Powders and Explosives**

PB CLERMONT 176 rue de Clermont - 4480 ENGIS - BELGIUM Phone: (19) 32 41 75 10 15 SNPE Group ownership: 100 percent Capital: Fr33 million Businesses: the manufacture of spherical powders and fuel inserts for civil and military use.

**Survivability**

AEMC 1111 Jefferson Davis Highway - Suite 700 ARLINGTON - VIRGINIA 22202 - USA Phone: (19) 1 703 553 03 80 SNPE Group ownership: 50 percent Capital: Fr34 thousand Businesses: the manufacture and marketing of reactive armoring.

INEXCO Centre industriel et technique Route d'Ardon - 45240 LA FERTE-SAINT-AUBIN Phone: (16) 38 51 66 11 SNPE Group ownership: 50 percent Capital: Fr2.5 million Businesses: the manufacture and marketing of composite explosive loadings for military use.

**Pyrotechnics**

PYROMECA Chemin Charles Battezzati - Quartier Lagoubran BP 2148 - 83063 TOULON Phone: (16) 94 22 86 86 SNPE Group ownership: 92.2 percent Capital: Fr12.5 million Businesses: research and manufacture of pyrotechnical devices for the military, space, manufacturing, and offshore industries.

**The Chemicals Division****Organizational Chart**

Head: Jean-Paul Hufschmitt

Divisions accountable to Hufschmitt: Intermediates and Agrichemicals, J.-P. Morgades; Pharmaceutical Specialties, D. Wirtz; Nitrocellulose, B. Fontana; Cosmetics, L. Sousselier

Facilities: Sorgues, A. Darney; Toulouse, S. Morales



Principal Manufacturing Subsidiaries, followed by percentage of SNPE ownership: Isochem, 100 percent; Propeptide, 100 percent; Neosystem, 59 percent; Chemilyl, 50 percent; Bergerac NC, 66.7 percent; and Tevco, 100 percent.

Jean-Paul Hufschmitt heads the Chemicals Division, which aims to bolster SNPE's position in fine chemicals for pharmaceutical, agrochemical, polymer, and cosmetic use. The Division seeks to gain a foothold in niches where the Group has a chance of becoming a major national and international player. Its strategy in 1992 was based on seeking partnerships with manufacturing groups that could offer final markets or provide know-how complementary to SNPE's. This alliance strategy is paying off. Indeed, Division sales jumped from Fr1,050 million in 1994 to Fr1,400 in 1992, despite the structural slump in Europe's plant health market that affected the Division's businesses. Subsidiaries accounted for half of that turnover. The Chemicals Division continued to internationalize in 1992 by forming subsidiaries with partners. A notable example is BERGERAC NC, created with the Italian group BPD. The Division has shifted its focus back to its greatest strength, fine chemicals. The Sorgue and Toulouse sites launched a four-year industrial investment program (1992-95), and the Toulouse facility is embarking on three years of investments to improve safety and environmental protection. Its first achievements were to confine areas of chlorine storage and evaporation and phosgene production, and to create a network of sewers and retention basins to prevent accidental pollution spills. The ISOCHM subsidiary acquired a waste-destroying incinerator for increased environmental protection.

The Chemicals Division's push for quality resulted in most of its activities at the Toulouse, Sorgues, and BERGERAC NC production plants receiving ISO 9002 certification in 1992.

At the same time, the Chemicals Division rationalized its portfolio of businesses and reorganized. For instance, it sold its photo-crosslinked resin business, which was too far away from its fine chemicals core, to Harcros (UK). Hexamine production, which suffered from a lack of integration upstream, was halted.

Intermediates and Plant Health Specialties were combined in a single Intermediates and Agrichemicals Department. The Division's marketing and development teams were grouped together in Facilities, to bring sales and production teams into closer contact. This creates departments that are closer to customers and better able to respond to demands in real time.

Staff: 1,663 Sales: Fr1,405 million Added value: Fr532 million Operating margin: Fr167 million

#### Departments of the Chemicals Division

##### Intermediates and Agrichemicals - Jean-Pierre Morgades

The Intermediates and Agrichemicals Department headed by Jean-Pierre Morgades is responsible for researching, developing and marketing carbonyl chloride derivatives and nitrated products, synthesis intermediates used in various manufactures, and active substances for agrichemical use. Synthesis intermediates are used for essentially five purposes:

—In the plastics or paper industries, to synthesize polymerization catalysts, produce intermediates for waterproof paper finishing, and fabricate monomer styrene polymerization inhibitors.

—In pharmacy, as intermediates to synthesize pharmaceuticals.—In agrichemistry, as synthesis intermediates for pesticides, active substances, and pattern syntheses.

—In the energy industry, to produce fuel for space propulsion (monomethyl hydrazine, or MMH, and unsymmetrical dimethylhydrazine, or UDMH) and manufacture fuel additives (nitrate of ethyl hexyl, or NEH).

—In dyes for general industry. The possibility of a joint venture with the Hungarian company Borsodchem was looked into during 1992.

The goal of the agreement is to produce, at the Kazincbarcika facility, a range of phosgene derivatives that would enable SNPE to round out its commercial line and secure a place for itself in the world market for fine chemical intermediates. In 1993, the agreement gave birth to a joint subsidiary, FRAMOCHEM, which will make and market phosgene derivatives and synthesis intermediates.

SNPE has teamed up with Nippon Paint to produce MAI, an acyl isocyanate for the ink market. Further upstream in the manufacturing process, new subsidiary CHEMILYL produces oxalyl chloride, an ingredient in the synthesis of MAI, bolstering the partnership.

Most of the plant health products put out by the Sorgues facility, which is becoming an increasingly important player in fine chemicals, target the agrichemical market. SUDSYN-THÈSE, a joint subsidiary of SNPE and Shell Chemicals, is located at Sorgues, and develops and makes organic composites, especially nitrated derivatives. SNPE Group's other platform for fine chemicals, in Toulouse, produces phosgene derivatives and space propulsion intermediates such as UDMH, MMH, and ammonium perchlorate.

##### Pharmaceutical Specialties - Didier Wirth

In 1992, SNPE shored up the already strong position it had gained in pharmaceuticals through the manufacture of phosgene derivatives by concentrating pharmaceutical expertise in a "hub." The hub is organized around ISOCHM, a fully-owned SNPE Group subsidiary, and incorporates IRCHA CHIMIE FINE (ICF), LC CHIMIE, and two other subsidiaries, PROPEPTIDE and NEOSYSTEM. The Department of Pharmaceutical Specialties, headed by Didier Wirth, pulls together all the activities of the hub and of CHEMILYL, a subsidiary created around the know-how of Tessenderlo Chemie and SNPE (50/50 ownership). CHEMILYL started up its new oxalyl chloride plant on time and without cost overruns in 1992. Oxalyl chloride, a phosgene-complementary reagent used in delicate syntheses, gives SNPE a line better able to compete for the business of pharmaceutical groups.

It also makes SNPE one of the leaders in that niche, whose sales are expected to grow by 5 to 7 percent a year. The trend is driven primarily by the very strong projected growth in peptide synthesis, an important niche for SNPE, notably through its NEOSYSTEM and PROPEPTIDE subsidiaries.



The Department of Pharmaceutical Specialties develops and makes synthesis intermediates and original or generic finished products for the pharmaceutical industry, pattern synthesis, and process development.

The Toulouse facility, which specializes in fine chemicals, built a monomethyl hydrazine (MMH) shop in 1992, to serve both the space and pharmaceutical industry markets.

A plant to retreat triphenylphosphine (TPP) began operation in 1992. SNPE teamed up with a big pharmaceutical group to study the regeneration of this byproduct of a vitamin manufacturing process.

The Department is expanding its marketing efforts aimed at a hundred customers in the world, notably in the United States, Europe, and Japan. It is also investing heavily in research and development.

#### **Nitrocellulose - Bernard Fontana**

The Nitrocellulose Department, which is headed by Bernard Fontana, works through the subsidiary BERGERAC NC. The Italian group SNIA-BPD, a nitrocellulose producer, created the subsidiary with SNPE in July of 1992. The new firm transferred production that had been carried out by SNIA-BPD in Italy to the Bergerac site. It reorganized every aspect of production line operation, and significantly boosted productivity.

BERGERAC NC focuses exclusively on the production and marketing of nitrocellulose, making SNPE Group the world's second-ranking and Europe's top manufacturer in that market. It has rounded out its sales network with a distribution company for the Italian market, dubbed ITAL-NITRO.

Nitrocellulose has many applications, among them powders for hunting and military use, dynamites, wood and leather varnishes, inks, paints, and nail polish bases. Two complementary products formulated at Bergerac—collodions (nitrocellulose solution) and neplasts (ink emollients)—are used in industrial nitrocellulose markets.

The highly scattered market (70-percent export) for nitrocellulose comprises small and medium-size manufacturers throughout the world. The biggest markets for industrial nitrocelluloses are inks (31 percent), wood varnishes (30 percent), and paint (18 percent).

#### **Cosmetics - Laurent Sousselier**

Laurent Sousselier heads the Cosmetics Department, which produces and markets a vast line of products representing various stages in the manufacture of nail polish. The Department's line includes X nitrocelluloses (specially for nail polish), colorless and dye bases, and bulk colored polishes. Hypoallergenic products (without toluene or formal) and, since 1992, specialized nail care products (new removers, hardeners, etc.) round out the line. Now that SNPE has started operating its new TEVCO plant in the United States and bought out the American brand Durlin and the French brand Pylaline, it is the world's top producer of nail polish, supplying 20 percent of the market.

Production at the TEVCO and SNPE Bergerac sites is divided into three geographical areas. TEVCO serves the entire American market plus the Asian color polish market. Bergerac supplies the base polishes for Asia and all products

for Europe, including Eastern Europe. To shore up its international position in the nail polish market, SNPE also put together various collaborative deals in Asian and East European countries in 1992.

#### **The Principal Subsidiaries of the Chemistry Division**

##### **Pharmaceutical Specialties**

ISOCHEM 4 avenue Philippe Lebon 92230 GENNEVILLIERS Phone: (16) 1 47 94 97 00 SNPE Group ownership: 100 percent Capital: Fr50 million Businesses: fine chemicals for the pharmaceuticals and corresponding engineering industry (quinine), and trade of associated products and materials.

IRCHA CHIMIE FINE - ICF, ISOCHEM subsidiary 4 avenue Philippe Lebon Phone: (16) 1 47 94 97 00 SNPE Group ownership: 100 percent Capital: Fr1 million Businesses: the manufacture and sale of chemical products for pharmaceutical use.

LC CHIMIE, ISOCHEM subsidiary 4, avenue Philippe Lebon 92230 GENNEVILLIERS Phone: (16) 1 47 94 97 00 SNPE Group ownership: 93.8 percent Capital: Fr2.4 million Businesses: manufacture and sale of chemical products and derivatives for pharmaceutical use.

PROPEPTIDE Rue Lavoisier BP 12 91712 VERT-LE-PETIT Cedex Phone: (16) 1 64 99 11 08 SNPE Group ownership: 100 percent Capital: Fr4 million Businesses: manufacture and sale of peptide synthesis intermediates, essentially for the pharmaceuticals industry.

NEOSYSTEM 7 rue de Boulogne 67100 STRASBOURG Phone: (16) 88 79 08 79 SNPE Group ownership: 59 percent Capital: Fr7.3 million Businesses: research, development, manufacture, and marketing of peptides and derivatives.

CHEMILYL 22 rue Clemenceau BP 39 59374 LOOS LES LILLE Phone: (16) 20 22 58 58 SNPE Group ownership: 50 percent Capital: Fr14 million Businesses: manufacture of chemical products derived from chlorine and phosgene; CHEMILYL began operating industrially on 15 November, 1992.

##### **Nitrocellulose**

BERGERAC NC Boulevard Charles Garaud BP 814 24108 BERGERAC Cedex Phone: (16) 53 63 63 63 SNPE Group ownership: 66.7 percent Capital: Fr150.2 million Businesses: manufacture and marketing of chemical products, notably nitrocelluloses (takeover of SNPE's production in Bergerac). Marketing in Italy handled by the subsidiary ITAL NITRO, wholly-owned by BERGERAC NC.

##### **Cosmetics**

TEVCO 110 Pomponio Avenue South Plainfield New Jersey 07080 USA Phone: (19) 1 908 754 7306 SNPE Group ownership: 100 percent Capital: Fr20,000 Businesses: manufacture and sale of nail polish.

#### **The Materials Division**

##### **Organizational Chart**

Headed by Bernard Hueber, to whom are directly accountable four departments: Hunting and Marksmanship, run by J.P. Devaux; Industrial Explosives, B. Rosso; Composites

and New Materials, J.P. Vettori; and Non-Military Pyrotechnics, including automobile safety and public order. The Division has facilities in Pont-De-Buis, run by M. Stephan, and Vonges, headed by D. Surroca. Its main manufacturing subsidiaries, followed by percentage of SNPE ownership, are: TUNET, 99.6; Armunits Productions (ARPRO), 97.2; Martignoni, 75; Nobel Explosifs France (NEF), 100; Nobel Explosifs Belgium (NEB), 100; Structil, 100; ATMC, 100; Brunet SICAP, 95.4; Melco, 65; Livbag, 50; and Pyro Safety Device, 50.

Bernard Hueber heads the Materials Division, which manages several of SNPE Group's diversified businesses through autonomous Departments that focus on specific niches. The Departments are: Hunting and Marksmanship, Industrial Explosives, Composite Materials, and Non-Military Pyrotechnics, which includes the Public Order market.

The Division continued to expand its businesses in 1992, despite stepped-up competition amid a recession that is affecting all aspects of every industry. SNPE has everything it needs to position itself in these markets, which are consistent with its development goals. SNPE draws its strength from its expertise in the fields of chemistry, physics, military pyrotechnics, and materials science, and from its affinities with the weapons and aeronautics markets.

Backed by the prestige of a big international group, the Materials Division can offer all of its customers great flexibility and responsiveness, through a network of independent subsidiaries.

Staff: 1,307, Sales: Fr791 million, Added value: Fr336 million, Operating margin: Fr77 million

#### **The Departments of the Materials Division**

##### **Hunting and Marksmanship - Jean-Paul Devaux**

In 1992, Jean-Paul Devaux's Hunting and Marksmanship Department pursued its strategy of working more closely with complementary firms, and shored up its position as the European leader in a sharply declining market for hunting and marksmanship cartridges.

The combined skills of its primary subsidiaries ARPRO, TUNET, and MARTIGNONI, and of its Pont-de-Buis hunting-powder manufacturing facility, give the Department expertise in every technique used to manufacture cartridges and their components (powders, inserts, fuses, etc.). The celebrity of its famous brands—VECTAN, VIR, FOB, and TUNET—makes it a force in the market.

SNPE bought out the gunpowder and cartridges business of the Italian group Sipe Nobel in July, 1992, and transferred production of shot and rolled powders to its Pont-de-Buis facility. It now offers a very broad range of competitive products to its international customers. SNPE distributes its line in Italy through a recently created subsidiary dubbed NOBEL SPORT ITALIA (NSI). The Group signed a partnership agreement with the Spanish cartridge assembler Excopesa, increasing its international scope in this niche, and created a joint subsidiary to distribute hunting and marksmanship cartridges in the Spanish market in early 1993.

SNPE undertook negotiations with the Humbert de Saint-Étienne group in 1992, with a view to extending its trading activities to weapons, metal munitions, and reload ammunition. The discussions resulted in the creation of a new joint company, controlled by SNPE, in early 1993.

SNPE Group also formed the NOBEL SPORT FRANCE (NSF) consortium with the Italian group Berretta, one of the world's most prestigious gunmakers. The economic interest group will jointly market a wide range of their respective products, and attempt shore up their leadership in the French market.

##### **Industrial Explosives - Bernard Rosso**

Bernard Rosso heads the Industrial Explosives Department, which is organized around NOBEL EXPLOSIFS FRANCE and its various subsidiaries, NOBEL EXPLOSIFS BELGIQUE, EURODYN, and EXPLO-TECH. Industrial Explosives specializes in the manufacture of explosive emulsions and in the distribution of a full line of industrial explosives and detonation accessories to mines, quarries, and public works projects. Expanded customer services and export sales enabled the Department to offset a slight drop in sales volume in its French and Belgian markets. Belgian factories revamped their production in 1992, industrially developing emulsion manufactures at Chatelet and halting the production of nitroglycerine and explosive gels in the Balen factory.

In 1992, NOBEL EXPLOSIFS FRANCE expanded its explosion plating business. This original and innovative technique, marketed under the brandname NOBELCLAD, uses an explosive charge of plates of different metals to weld. Viable market outlets for it are cropping up among boilermakers. In 1992, NOBELCLAD strengthened its leadership position in Europe, where it holds 60 percent of the market, in two ways. It acquired a majority stake in the Swedish company Nitrometall AB, and created a marketing subsidiary, BVM Metall Handel GmbH, in Germany, after one of its competitors there shut down manufacturing operations.

##### **Composites and New Materials - Jean-Pierre Vettori**

The Composites and New Materials Department, headed by Jean-Pierre Vettori, reorganized its research, development, and marketing components.

As a result, different production centers now specialize in certain technologies, and the marketing staff of profit centers have shifted their focus back to core businesses.

Accordingly, despite serious structural problems and the recession, the BURNET SICAP company specialized in the production of complex, high-technology parts, and resumed manufacture in 1992 of certain aeronautics products that had been handled at the Pont-de-Buis facility.

Likewise, the MELCO subsidiary returned to its basic businesses, namely metal/metal or metal/composite bonding, armoring, and insulation.

In a tough competitive market suffering from a sharp drop in aeronautic and defense orders, SNPE Group seeks to remain or become the first choice of big weapons, aeronautic, space, and rail contractors. The Group is highly

capable in the principal composite transformation processes and maintains a high level of research and development work.

The Composites and New Materials Department designs and develops its product lines around three specific areas of expertise.

- Semi-finished products, including preimpregnates and structural adhesives made by the STRUCTIL subsidiary, and MARPLEX's radar-wave-absorbing materials.
- Industrial composites, including the manufacture of body parts for ground transport (ATMC and the Composite Department of the Vonges facility), light fixture frames, and various industrial parts.
- High-performance composites, namely the manufacture of space, aeronautic, and defense technical parts by SNPE subsidiaries BRUNET SICAP and MELCO.

### Non-Military Pyrotechnics

#### Automobile Safety

After several years spent researching gas generators, SNPE Group teamed up with the group Autoliv Klippan in 1992 to create the LIVBAG SA company. LIVBAG SA designs, produces, and markets gas generators for automobile safety devices. Its Pont-de-Buis (Finister) factory has begun industrial production of gas generators for inflatable airbags.

Specifically, LIVBAG SA markets an original product, Euroflator, which was designed for European cars to the entire auto industry. Euroflator protects drivers with an inflatable 30-liter bag that generally begins to inflate when a pyrotechnical microgenerator activates safety belt retractors.

Two wholly-automated production lines crank out over 400 Euroflators and microgenerators an hour. A new line will start operating in 1993, to manufacture American-style 60-liter generators. LIVBAG's work also boosted the volume of the Group's industrial pyrotechnical production in the Saint-Medard (powder blocks for Euroflators) and Pont-de-Buis (sodium nitride pellets) facilities.

LIVBAG SA products were extremely well received when they were exhibited at the main Auto Shows in 1992, and the subsidiary expects sales to grow rapidly.

#### Public Order

The Public Order section is part of the Non-Military Pyrotechnics Department in the Pont-de-Buis facility. It manufactures a complete line of tear gas products for use in maintaining public order. The section shored up its commercial position in 1992 by significantly boosting sales in France and abroad and by offering customers a complete line of products manufactured by SNPE or others.

In addition to tear gas systems and products, the line includes pump guns and ammunition, armoring materiel (especially bullet-proof vests of composite materials), and a whole series of protective and operations equipment for security forces.

### The Principal Subsidiaries of the Materials Division

#### Hunting and Marksmanship

TUNET BP 15 31850 Mondouzil Phone: (16) 61 84 74 24 SNPE ownership: 99.6 percent Capital: Fr10 million Businesses: production of hunting and marksmanship cartridges (TUNET), trade in arms and hunting accessories.

ARMUNITS PRODUCTIONS - ARPRO Quartier de Mantaille BP 16 Anneyron 26140 SAINT-RAMBERT-D'ALBON Phone: (16) 75 31 28 33 SNPE ownership: 97.2 percent Capital: Fr38.7 million Businesses: manufacture of hunting and marksmanship (VIRI and FOB brands) cartridges, trade in arms. The company has a subsidiary, SPARTAN, that specializes in making inserts.

MARTIGNONI 85 via Geirato Molassana 16138 GENOVA, Italy Phone: (19) 39 10 85 24 41 SNPE Group ownership: 75 percent Capital: Fr2.2 million Businesses: production of fuses, inserts, and cartridges for hunting and marksmanship.

#### Industrial Explosives

NOBEL EXPLOSIFS FRANCE - NEF Tour Aurore 18 place des Reflets Cedex 5 92080 PARIS LA DEFENSE 2 Phone: (16) 1 47 78 55 50 SNPE ownership: 100 percent Capital: Fr30 million Businesses: industrial explosives and detonation accessories for quarries, mines, public construction projects, and explosion plating.

NOBEL EXPLOSIFS BELGIQUE - NEB 12 avenue de Broqueville 1150 BRUSSELS, BELGIUM Phone: (19) 32 27 62 16 72 SNPE Group ownership: 100 percent Capital: Fr16.5 million Businesses: industrial explosives and detonation accessories for quarries, mines, public construction projects, etc.

#### Composites and New Materials

STRUCTIL 18 rue Lavoisier BP 10 91710 VERT-LE-PETIT Phone: (16) 1 64 93 49 49 SNPE ownership: 100 percent Capital: Fr24.5 million Businesses: production of composite materials and adhesives for aeronautics, sports (tennis rackets, fishing rods), and industrial uses (weaving needles, tripods), etc.

ATMC Z.I. Chef-de-Baie Avenue du President Wilson 17000 LA ROCHELLE Phone: (16) 46 43 53 23 Capital: Fr3 million Businesses: manufacture of composite material parts primarily for the transport market.

BRUNET SICAP 42 rue Dutemple 62800 LIEVIN Phone: (16) 21 29 11 66 SNPE Group ownership: 95.4 percent Capital: Fr22.8 million Businesses: design and manufacture of composite material parts for aeronautics, military, and industrial use.

MELCO Rue des Canaux BP 54 91470 LIMOURS Phone: (16) 1 64 91 02 18 SNPE Group ownership: 65 percent Capital: Fr20 million Businesses: research and manufacture of composite material equipment and subassemblies, essentially for the aeronautics and defense industries (armoring).

#### Non-Military Pyrotechnics

LIVBAG Route du Beuzit 29590 PONT-DE-BUIS Phone: (16) 98 81 30 00 SNPE Group ownership: 50 percent Capital: Fr250,000 Businesses: study and manufacture of



gas microgenerators for safety belt pyrotechnical retraction devices, and of gas generators used in "airbag" auto safety systems.

**PYRO SAFETY DEVICE** Yushima Tokyu Bldg. 37-4 Yushima 3 Chome Bunkyo-Ku TOKYO 13 JAPAN Phone: (19) 81 33 56 88 04 25 SNI E Group ownership: 50 percent Capital: Fr2.2 million Businesses: importation, manufacture, and sale of pyrotechnical devices for safety belts.

#### Personnel

During the past year of sluggish economic growth and restructuring in the weapons industry, SNPE Group has striven to remodel itself in basic ways to reflect new realities.

In 1992, the Group involved its many subsidiaries more closely in its projects. Much thought was given to managing human resources, especially professional-level workers, at the Group level. As a consequence, the Group continued efforts to assess the job performance and descriptions of executives and engineers, and provided specific training. Orientation seminars for new professional workers were adapted for and extended to subsidiaries. At the same time, two important projects got underway: negotiation of the company agreement, and the establishment of a new, personnel information-processing system. The Group also devised a plan to retrain staff.

Renegotiation of the company agreement, which was eventually signed, sparked intense discussion throughout 1992. The accord extends retirement benefits to non-professional workers, by setting up a single, efficient retirement system for all employees. The agreement also provides career guarantees for personnel representatives. The accord includes important provisions for training, to prepare employees for the new skills they will need as SNPE diversifies its products now and in the future. The Group has set up a new system, dubbed IRIS, for processing personnel information, and handling payroll. SNPE was forced to continue adjusting its production and support units to reflect the new world economic and geopolitical situation. Since its diversified businesses alone cannot yet offset the effects of the industry's structural crisis, SNPE has established resource adjustment plans in some of its facilities. The plans aim to continue resizing the company and rationalizing its production tool, while making the most of those assets that will help SNPE in the future.

#### SNPE Across Five Continents

SNPE scored two international successes in 1992: a commercial one in Japan, and an industrial one in Hungary.

The commercial subsidiary SNPE JAPAN had an excellent year in an expanding market. Its sales have doubled, to Fr62.6 million, in two years.

The Japan subsidiary began negotiations with several candidates to establish new partnerships in the areas of fine chemicals and intermediates.

Moreover, the Japanese automobile safety market is already showing promising growth, and SNPE laid the groundwork to penetrate it when it created a joint, 50/50 subsidiary with the Japanese firm NOF in 1987. The subsidiary, PYRO SAFETY DEVICE, specializes in safety belt retractors.

In the chemicals sector, SNPE strengthened its position in central and eastern Europe by successfully negotiating the creation of FRAMOCHM KFT (production and marketing of phosgene derivatives) in 1993.

Stepped-up efforts in the United States in 1992 will help implement a medium- and long-term strategy for the sale of defense products, notably insensitive munitions (IM).

SNPE's new general delegate for North America, Bernard Zeller, helps bolster the Group's presence there. Zeller represents SNPE's chairman of the board in the United States and Canada.

SNPE unearthed several new markets in different parts of the globe in 1992. In central and eastern Europe, it discovered a demilitarization market for the destruction of conventional and chemical munitions, and a market for equipment to maintain public order. SNPE spied opportunities in Vietnam to provide police equipment, cosmetics, and munitions. Finally, market research for reactive armoring products uncovered promising niches in Europe and the Far East.

#### Marketing Subsidiaries

**SNPE NORTH AMERICA** 103 Carnegie Center Road One PRINCETON NJ 08540 USA SNPE Group ownership: 100 percent Capital: Fr18.8 million Businesses: marketing of SNPE Group products in North America.

**SNPE JAPAN** Onarimon Yusen Bldg. 13F 3-23-5 Nishi Shinbashi Ninato Ku TOKYO 105 - JAPAN SNPE Group ownership: 100 percent Capital: Fr5.8 million Businesses: marketing of SNPE Group products in Japan.

**SNPE ENGLAND** Suffolk House George Street Croydon-Surrey Cro IPE ENGLAND SNPE Group ownership: 100 percent Capital: Fr0.5 million Businesses: marketing of chemical and nitrocellulose products in Great Britain and Ireland. Subsidiary attached to the Chemicals Division.

**SNPE GmbH** 47 Reuterweg D 6000 Frankfurt/Main 1, GERMANY SNPE Group ownership: 100 percent Capital: Fr0.3 million Businesses: marketing of nitrocellulose, chemical products, and structural materials in Germany. Subsidiary attached to the Chemicals Division.

#### SNPE Group Markets

##### An Organization That Bolsters Marketing Efforts

SNPE Group is organized around the concept of professional specialization, both in terms of products and markets.

Such an approach was the only logical response to the diversity of SNPE's product line and the wealth of its knowledge.

Indeed, experience combined with an in-depth analysis of our sales activity proved that a single market can involve several Departments, and even several Divisions.

That being the case, SNPE's Central Marketing Division provides a coordinated, consistent, and effective marketing policy.

##### The Defense and Public Order Market

The big customers in the defense market are Defense Ministries, general staffs, and, for the maintenance of public



order, police chiefs. Although defense has traditionally been SNPE's largest market, the police equipment niche is a more recent one, whose current development is promising. SNPE products for this combined market include: military gunpowder and explosives; reactive armoring; IR and electromagnetic countermeasures; composite explosives for insensitive munitions; propellant loadings for engines; armoring and protection of personnel and equipment for defense and police markets; composite structural parts for defense systems; and a complete kit of grenades, tear gas, and rubber bullets.

#### **The Aerospace Market**

Because of its knowledge and experience of military propulsion systems, space was a natural market for SNPE Group to diversify into.

SNPE is the only European group to offer all the fuels and propellants used in space propulsion. At the same time, the Group's Composites and New Materials Department supplies increasingly advanced composites to aircraft manufacturers and pyrotechnical safety systems to chief contractors of space programs. Products include: composites for use in aerospace equipment; aerospace pyrotechnical safety systems; propellants and fuels; fuels for space launchers.

#### **The Market for Coatings, Plastics, and Various Intermediates**

SNPE sells synthesis intermediates used in the manufacture of certain big polymers to companies specializing in polymerization catalysts. It produces base resins (nitrocellulose and emollients) for formulators of inks, varnishes, and paints. SNPE also makes special chemicals such as NEH, which oil companies use as a fuel additive, and AKD, to waterproof special papers. Main products: nitrocellulose; synthesis intermediates for polymerization catalysts; fuel additives.

#### **The Pharmaceutical, Agrichemical, and Cosmetics Market**

This is the market in which the Group's efforts to diversify have been most successful. Many big groups have teamed up with SNPE, which supplies them with active substances and special intermediates, or, in the case of nail polish, with a bulk supply of the finished product. Main products: active substances and synthesis intermediates for pharmaceuticals; peptide synthesis for the pharmaceutical industry; active substances and synthesis intermediates for agrichemicals; nail polish.

#### **The Engineering Market**

SNPE is putting its know-how to work through engineering contracts with chief contractors and project sponsors from the chemical, paracheimical, and weapons industries. It also provides research and consulting services on industrial risks. Main products: engineering; operational safety; industrial explosives for wrecking and plating; pyrotechnical systems.

#### **SNPE Engineering**

SNPE Engineering's shareholders changed in 1992, when SGN, the Cogema group's engineering subsidiary, acquired 50 percent of its capital.

SNPE Engineering is thus helping to shore up the Eurisys Network engineering hub, led by SGN and made up of a group of industry and consulting firms. The switch enables SNPE Engineering to provide a stronger range of services by utilizing the human and technical potential of the Network, without giving up its management autonomy or specific expertise (chemicals, defense, space, pyrotechnics, safety) within SNPE Group. Despite an unfavorable economic climate, SNPE Engineering's business remained stable in 1992. A substantial export deal and continued growth in the Security, Environmental, and Safety Department kept sales at a level close to that of previous years.

SNPE Engineering 8 cours Louis Lumiere 94306 VINCENNES Cedex SNPE Group ownership: 50 percent Phone: (16) 1 49 57 75 00 Capital: Fr15 million Businesses: research and manufacture of "turnkey" industrial units, safety engineering, trade in products and equipment.

#### **The Mines, Quarries, Public Construction, and Offshore Market**

SNPE Group produces industrial explosives that are used by quarries and public works companies. It is developing an explosive plating business for boiler sheets employed in the nuclear, chemical, shipbuilding, and electric power industries.

The Group sells syntactic foam for offshore platforms to oil companies.

SNPE is developing a consulting and contracting business for the explosive wrecking of phased-out, unhealthy, or dangerous sites. Main products: industrial explosives for plating; pyrotechnical systems for wrecking; syntactical foams.

#### **The Sports and Recreational Market**

SNPE produces and markets all components of hunting and marksmanship cartridges, including all kinds of powders, to cartridge assemblers. In addition, the Group manufactures different cartridges under various brandnames that are sold to weapons dealers and large, specialized retail outlets.

SNPE is also involved in the recreational market, where it sells reinforcing pieces to manufacturers of sports and recreational equipment (tennis rackets, golf clubs, large sail battens, mountain bike frames, etc.) Main products: hunting gunpowder, inserts, and cartridges; carbon epoxy and pre-impregnated pultruded sections.

#### **The Transports and Urban Planning Market**

SNPE's combined know-how in materials, pyrotechnics, and gas generators enable it to offer manufacturers both body parts and interior furnishings for transportation equipment, and safety belt and airbag systems. Main products: interior and body components for trains and automobiles; pattern molding of composite parts for urban furnishings; pyrotechnical devices for automobile safety.

## Business Report for Fiscal Year 1992

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#### BOARD OF DIRECTORS 1992 MANAGEMENT REPORT

##### Ladies and Gentlemen:

We invited you to this Ordinary General Meeting, in accordance with the law and our charter, to report to you on the management of your Company and SNPE Group during fiscal year 1992, and to submit for your approval the annual accounts as of 31 December 1992 and the resolutions proposed by the Board of Directors.

You will also hear the independent auditors report on their findings.

### I - Important Events

Fears for 1992 were unfortunately borne out. In addition to the structural crisis that has affected defense industries since mid-1991, SNPE has suffered from the French economic recession that began in September of 1992, and from Europe's monetary crisis.

The new world geopolitical balance has prompted governments everywhere to slash their defense budgets and revise programs. France's thorough-going overhaul of its nuclear program has had an overall negative effect on the company, despite the decision to launch the M5 program.

Contrary to expectations at the beginning of the year, general economic trends deteriorated sharply beginning in the third quarter, and no recovery is expected before the second half of 1993. In the fourth quarter, France's gross domestic product shrank 0.5 percent below that of the third. Among those industries hardest hit, chemicals, aeronautics, and recreation directly affect SNPE's diversified businesses.

Finally, Europe's monetary crisis resulted in a sharp depreciation of the lira, pound, and peseta, causing SNPE to become significantly less competitive in terms of price than several of its major rivals.

Against this backdrop, SNPE vigorously pursued its policy of adaptation and diversification.

The layoff plan adopted in December 1991 was implemented, resulting in the departure of over 500 workers in 1992. It will continue during the first half of 1993. A new layoff plan was implemented in our PB CLERMONT subsidiary in Belgium, reducing staff by about 30 percent. We have maintained a stringent wage policy, and no general raise was granted in 1992. A new company agreement was negotiated, which extended retirement benefits to non-professional workers. This establishes an efficient retirement system for all employees.

As of 31 December 1992, SNPE Group staff numbered 6,483, against 7,285 in 1991.

In September 1992, the Group reorganized to beef up management structures. Four Central Divisions were set up, to provide better coordination of manufacturing, marketing, finances, and human resources.

To encourage the rational use of resources in Europe and strengthen our collaboration with big groups, it was decided to create subsidiaries for our nitrocellulose business and for tactical propulsion marketing and research. These changes were effected 1 July 1992.

To the same end, SNPE decided to sell 50 percent of the capital of its SNPE ENGINEERING subsidiary to Cogema group's SGN company. The incorporation of SNPE ENGINEERING into a group of diversified engineering companies should afford it access to new markets and enable it to adjust as best it can to reduced workloads when construction of the Kourou propellant plant is complete.

SNPE actively pursued its policy of diversification via acquisitions, though at a slower pace than in 1991. The main events of 1992 or of the first few months of 1993 were as follows.

—In the hunting market, SNPE acquired the industrial and commercial powder assets of the Italian group BPD, enabling us to transfer most of the powder production formerly handled in Italy to the Pont-de-Buis factory. In early 1993, ARMUNITS PRODUCTIONS, the Humbert company, and the Beretta group decided to work together in marketing hunting arms and munitions. Finally, in 1993 ARMUNITS PRODUCTIONS created a marketing subsidiary in Spain with the Spanish cartridge assembler Excopesa.

—In the area of chemicals, SNPE and the Italian group BPD merged their nitrocellulose business in the BERGERAC NC firm. Production was halted in Italy and transferred to the Bergerac SNPE factory. In the booming peptides market, SNPE strengthened its position by taking control of the NEOSYSTEM company, which has turnover of Fr15 million. In 1993, SNPE plans to acquire control of a Hungarian firm that specializes in the manufacture of phosgene derivatives, in collaboration with the Hungarian company Borsodchem.

—In the automobile safety niche, SNPE and Autoliv Klippan decided to create LIVBAG SA and put it in charge of developing, producing, and marketing gas generators for inflatable cushions, beginning in 1993. The company, whose manufacturing equipment is located at the Pont-de-Buis site, should employ 180 people and generate sales of about Fr500 million by 1995.

Finally, the shareholders decided to bolster SNPE's equity in 1993 with a cash contribution of Fr300 million. This will make it possible to stabilize the group's debt and keep interest expenses at a reasonable, albeit high, level.

## II - Changes in SNPE Group Business

Consolidated sales declined 11.5 percent in 1992 to Fr4,213 million, against Fr4,758 million in 1991.

Changes in sales by business area are shown in the following table.

	1992		% Change over 1991
	in FrMillions	in %	
Defense & Space Division	1,969	46.7	-23.2
Chemicals Division	1,405	33.4	+4.8
Materials Division	791	18.8	-2.8
Others	48	1.1	+20.0
TOTAL	4,213	100	-11.5

Non-military activities account for just under 60 percent of sales.

The table below gives the geographical distribution of sales.

	1992		% Change over 1991
	in FrMillions	in %	
France	2,591	61.5	+0.12
Exports	1,175	27.9	-31.2
Foreign companies	447	10.6	-3.5
TOTAL	4,213	100	-11.5

The drop in export sales is due primarily to the fact that billing of the Kourou propellant factory was taken into account in 1991.

### A - The Defense & Space Division

Sales of all products were down sharply in 1992, and the Division was confronted with workload problems in all its facilities. Those problems were exacerbated by the need to adjust stock levels to the new market realities.

Consolidated sales totaled Fr1,969 million, a 23.2 percent decline over 1991. Hardest hit were Tactical Propulsion, Explosives, and combustible Powders and Objects.

Operating margins shrank again to Fr225 million. That compares to Fr339 million in 1991, or a drop of 34 percent.

Despite its current difficulties, the division continued to invest and to conduct research to prepare its future.

Extruder feasibility studies of an IM composition in the form of multiperforated powder grains resulted in some very promising trials. A new, clean propellant formulation was developed. The power of the scientific computing centers, BRC and Saint-Medard, was substantially boosted, expanding their capability to predict combustion instability.

Ground testing of the Ariane 5 rocket's future solid-propellant engine, conducted in 1993, was entirely satisfactory.

In 1992, the reactive armoring and demilitarization markets confirmed their promise as attractive areas for expansion over the next few years.

The division was reorganized around four departments:

- Propulsion;
- Powders and Explosives;
- Survivability;
- Demilitarization.

Discussions with Aerospatiale concerning the creation of an international hub for engine building were productive. The two companies combined their tactical propulsion research and marketing capabilities in CELERG, whose capital is now held by CELERG INTERNATIONAL company, starting retroactively on 1 July 1992. Negotiations have since gotten underway with other French and foreign companies, and may produce results in 1993.

As of 31 December 1992, the Division employed 3,171 workers, compared to 3,879 on 31 December 1991. Staff will fall again sharply in 1993.

### B - The Chemicals Division

The year started off very well for the Chemicals Division, which nonetheless began to feel the effects of the recession in September. Those effects are continuing in 1993.

The division's consolidated sales totaled Fr1,405 million, up 4.8 percent over 1991. Chemicals now account for one third of the Group's sales. Abroad, the division successfully pursued its penetration of the Japanese market and began discussions to collaborate with a large Japanese group.

The Fine Chemicals/Pharmacy Department continued to expand, spurred by strong growth in peptides. The group acquired a majority stake in the NEOSYSTEM company, which posted sales of Fr15 million. NEOSYSTEM's product line rounds out PROPEPTIDE's very nicely, and gives it access to new markets. To simplify management structures, ISOCHER absorbed its subsidiary AGRIFARM, and will do the same with its subsidiary IRCHA CHIMIE FINE in 1993.

Nitrocellulose production and sales, which were an integral part of SNPE, transferred to a newly-created subsidiary, BERGERAC NC, on 1 July 1992. BERGERAC NC acquired the industrial and commercial assets of a FIAT group subsidiary, which bought 33 percent of its stock, in July. It expects to post sales of over Fr400 million in 1993, and to show good profits.

Intermediate and plant health products were grouped together in a new department. Changes in the common agricultural policy and environmental pressures against some of the plant products strongly affected that business.

The division's operating margin in 1992 was Fr167 million, against Fr170 million in 1991.

The division has continued to invest, notably to upgrade nitrocellulose production facilities and get the CHEMILYL subsidiary's plant and the TPP factory in Toulouse up and running. Substantial amounts were spent to improve the safety of phosgene facilities in Toulouse.

In addition, Sorgues, Toulouse, and the BERGERAC NC subsidiary obtained ISO9002 certification.

### C - The Materials Division

The division posted consolidated sales of Fr791 million, a 2.8 percent decline over 1991.

Its operating margin was Fr77 million, against Fr105 million in 1991.

This significant drop is essentially the result of losses in the composite materials sector.

Sales of industrial explosives were stagnant, due to a general decline in volume in France and Belgium, and increased competition in the latter country. Profits, however, were still high. The Balen site in Belgium was shut down and production transferred to Chatelet, NOBEL EXPLOSIFS BELGIQUE's other plant, and to the SNPE Vonges site in France.

NOBEL EXPLOSIFS FRANCE shored up its position in explosion plating by taking control of the Swedish firm Nitrometall, and by negotiating a partnership agreement with a German firm after it ceased manufacturing in Germany.

SNPE bolstered its hunting supply business again when it purchased the industrial and commercial Powder assets of the Italian group BPD in July. The move led to the creation of a subsidiary to market gunpowder to hunters in Italy, and the establishment of two new powder production lines in Pont-de-Buis.

Overall, Hunting had a mediocre year due to the drop in demand and the price war waged by producers in every market. SNPE's subsidiaries remained profitable, although insufficiently so. Powder revenues should improve substantially in 1993, despite the fall in the Italian lira.

Composite Materials had an especially awful year. For one thing, the recession in aeronautics and defense send business levels spinning downward. For another, the division ran big deficits on certain contracts, as a result of technical problems that were underestimated when the contracts were signed and of low bids that could not be renegotiated. This last mistake accounts for most of the Fr20 million loss of the BRUNET SICAP company. Substantial measures have been taken to restructure the company and restore its balance.

Composite Materials' sales should rise sharply in 1993, and its losses decline dramatically. In addition, STRUCTIL expects to profit fully from the aeronautics qualification of its products.

The Japanese firm PYRO SAFETY DEVICE, in which SNPE holds 50 percent of the capital, boosted its sales of pyrotechnical devices for safety belts by over 60 percent. The devices are manufactured in Pont-de-Buis.

### III - SNPE Group Profits and Losses

The year's production came to Fr4,051 million, compared to Fr4,469 million in 1991, a drop of nearly 9.4 percent.

At Fr1,903 million, added value accounted for 47 percent of production, against 48.9 percent in 1991. The decline is partly attributable to the way the creation of subsidiaries affected accounting figures. It also reflects the relative drop in defense business as a total of sales.

The absolute value of personnel expenditures has dropped, from Fr1,617 million to Fr1,573 million. In contrast, spending on staff accounts for 82.7 percent of added value, compared to 74 percent in 1991 and 69 percent in 1990. The reason for this is that staff adjustments were not made until the second half of the year. The sharp drop in levies and taxes results from changes in the way SNPE records business use tax cancellations in its accounts.

When net interest expenditures of Fr146.5 million are factored in, current income is negative at Fr159.5, or a decline of Fr142 million.

The balance of extraordinary income and expenses is positive at Fr60 million, whereas it was negative (Fr140 million) in 1991.

The consolidated profit and loss statement shows a net loss of Fr67 million, which is less than the 1991 loss of Fr128 million.

### IV - SNPE Group Financial Situation

Although at Fr230 million SNPE's cash flow has sharply improved, it is still insufficient to meet financial needs.

Investments in tangibles came to Fr496 million. Most of it went to the parent company, PYROMECA, PB CLERMONT, BERGERAC NC, CHEMILYL, and ISOICHEM.

Medium and long-term debt grew Fr115.5 million, and the Group's total debt rose Fr373 million, to Fr1,682 million.

The structure of the consolidated balance sheet is shown in the table below.

	in FrMillions	in %		in FrMillions	in %
Fixed assets	2,094	40.9	Equity	1,125	22.0
Stocks	1,251	24.5	Contingency provisions	317	6.2
Other current assets	1,770	34.6	Long and medium-term debt	1,060	20.7
			Other current liabilities	2,613	51.1
	5,115	100		5,115	100

### SNPE Company Profits and Losses

Sales in 1992 totaled Fr2,839 million, against Fr3,658 in 1991, a decline of 22.4 percent. Assuming a comparable structure and excluding invoices for construction of the propellant factory in Guyana, turnover dropped about six percent. The decline is entirely attributable to Defense & Space, whose sales plunged nearly 16 percent.

The year's production totaled Fr2,612 million, a sharp decline over 1991, notably as a result of efforts to reduce stocks.

Added value dropped as a proportion of activity, to Fr1,268 million compared to Fr1,604 million in 1991. It represents 48.6 percent of production.



Mean staffing levels declined sharply, from 5,653 workers to 4,961. That is a 12 percent reduction, achieved through the layoff plan that was decided upon in 1991 and the creation of the Nitrocellulose subsidiary on 1 July 1992.

Personnel expenditures totaled Fr1,184 million against Fr1,239 million in 1991, and represent 45 percent of production. They will decline sharply in 1993.

Subtraction of the year's canceled business use tax lowered taxes and levies.

Operating income deteriorated, dropping from Fr36 million to Fr73 million.

Taking into account the negative financial balance of Fr94.5, compared to Fr73 million last year, current income totals Fr167 million, against Fr109 million in 1991.

Extraordinary income totals Fr497 million, compared to Fr214 million in 1991. Fr286 million derive from the creation of subsidiaries and recoveries from provisions for the layoff plan.

Extraordinary expenses come to Fr369 million against Fr295 million in 1991, with Fr269 deriving from subsidiary creation and the layoff plan.

Given negative taxes of Fr17 million, the company's net loss for the year is Fr22 million, compared to Fr168 million in 1991.

Cash flow has improved sharply over 1991, and stands at Fr180 million against Fr4 million.

Industrial investment, most of which went to projects that were launched prior to 1992, came to Fr316 million. It will drop sharply in 1993.

Financial acquisitions total Fr194 million, most of it coming from the counterpart of capital contributions to the BERGERAC NC and CELERG companies, repaid with stock in those companies.

During 1992, SNPE sold off 50 percent of its capital stake in the SNPE ENGINEERING subsidiary to Cogema group.

Though not as extensive as in 1991, a high level of research was maintained. Self-financed and contract research together accounted for nearly 24 percent of the company's sales.

## V - Changes at SNPE Company Subsidiaries

### 1. SOFIGEXI

SNPE Group's financial holding company SOFIGEXI made few new investments in 1992.

The gross value of its portfolio securities comes to Fr199 million, compared to Fr193 million in 1991. The difference results from the takeover of NEOSYSTEM and the sale of Garbolino shares. Securities provisions had to be substantially increased, essentially in response to changes in Composite Materials: allowances total Fr18 million, compared to cancellations of only Fr1.5 million.

Total losses from the three Composite Materials subsidiaries come to nearly Fr24 million.

BRUNET SICAP, which had invested heavily over the last few years, was especially hard hit by the flagging economy,

and suffered substantial losses on a contract that it negotiated at too low a price. Losses totaled Fr20 million for 1992.

ATMC's loss of an important customer, and the effects of the weapons and aeronautics industry slump on MELCO, explain their losses for the year, which came to Fr1.2 million and Fr2.5 million respectively.

In the chemicals sector, the American nail-polish maker TEVCO made a sharp recovery despite a flaccid economy for most of the year. Nonetheless, net income is still negative, at -\$110,000 U.S. TEVCO is expected to post profits in 1993.

Despite the increase in dividends received—which jumped from Fr3.5 million to Fr10 million in 1991—accounts showed a loss of Fr5.3 million.

### 2. PB CLERMONT

1992 was a tough year for BP CLERMONT, which lost orders for fuel cases from its main client.

The situation prompted the company to starting implementing a plan to cut 30 percent of its staff. It is also taking steps to reduce its working capital needs.

Turnover in 1992 came to Belgian Fr541 million (Fr89 million). Net losses totaled Belgian Fr54 million (-Fr9 million), of which Belgian Fr66 million (Fr10.5 million) were linked to layoff expenditures.

PB CLERMONT invested Fr22 million in 1992. Half the amount went to finish a nitroglycerine manufacturing plant that has been up and running since 1 July, 1992, and that enables the company to independently produce a raw material vital to its business. The remainder was spent to improve the safety and productivity of plants to manufacture spherical powders.

The company's cash flow for the year was Belgian Fr27 million (Fr4.3 million). Now that PB CLERMONT has adapted its industrial plant to suit market demand, it expects to show a profit again starting in 1993.

### 3. PYROMECA

In 1992 PYROMECA pursued research efforts aimed at developing a new generation of products. At the end of the year it moved into a new facility in Lagoubran, with enough space to accommodate its projected growth.

The sluggish economy and a supplier failure that prevented the delivery of certain products explains the company's five-percent decline in sales, to Fr71.4 million.

Termination losses on a development contract and moving expenses worsened the year's losses, which totaled Fr13.7 million. PYROMECA will probably break even again in 1993.

#### 4. BERGERAC NC

The company took over the Nitrocellulose activities of SNPE, which holds 67 percent of BERGERAC NC'S Fr150 million in capital, on 1 July 1992. It then acquired BPD group's nitrocellulose business at the end of July.

BERGERAC NC posted sales of Fr184 million, a cash flow of Fr8 million, and operating income of Fr0.8 million. Given the various extraordinary charges and exchange losses caused by the depreciation of the Italian lira, the company ended the year with a loss of Fr7.8 million.

In 1993, BERGERAC NC expects to generate sales of over Fr400 million and show substantial profits.

#### 5. ISOICHEM

In 1992, ISOICHEM absorbed its subsidiary AGRIFARM, which did most of its business with the parent company. With its two subsidiaries LC CHIMIE and IRCHA CHIMIE FINE (which bought IRCHA's chemicals business in 1991), the ISOICHEM group boasts a coherent industrial plant that can meet the demands of the pharmaceutical fine chemicals market.

The group racked up sales of Fr275 million in 1992, Fr235 million of which were generated by ISOICHEM company alone.

Investments totaled Fr20 million, and were spent primarily to build an effluents incinerator at the Pithiviers plant.

The group's cash flow is Fr27.6 million. ISOICHEM company's net income is Fr4.4 million.

Despite an unfavorable economic environment, essentially due to monetary problems, ISOICHEM plans to continue developing partnerships with big American, Japanese, and German laboratories in 1993, and to tighten existing links.

#### 6. STRUCTIL

STRUCTIL undertook a massive research program to get its products homologated in the aeronautics industry, while suffering the effects of a lackluster economy.

Its sales shrank 11 percent to Fr26.6, and the company lost Fr1 million in 1992, against Fr0.8 million in 1991.

#### 7. ARMUNITS PRODUCTIONS

In a tough environment, the company's sales plunged 18 percent to Fr80.7 million. Results were slightly positive, as in 1991. In France, its TUNET subsidiary, which specializes in cartridge manufacturing, posted a turnover of Fr45.5 million, down 12 percent over 1991. It had net income of Fr2.2 million, against Fr3.2 million in 1991.

In Italy, MARTIGNONI generated sales of Fr19.7 billion lire (Fr74 million), for a net income of Fr18 million lire.

During 1992, ARMUNITS PRODUCTIONS created a distribution subsidiary, NOBEL SPORT ITALIA, to market gunpowder for hunters in Italy. The company, which has capital of 20 million lire, posted sales of 4 billion lire and a net profit of 58 million lire.

#### 8. SNPE ENGINEERING

SNPE sold 50 percent of the capital of its subsidiary to SGN, a Cogema group subsidiary, in 1992. Incorporating SNPE Engineering into a group of engineering firms will help the company rechannel its business. It posted sales of Fr84 million, and net income of Fr1.9 million, thanks to an important job in Saudi Arabia and the continued growth of its Security, Environment, and Safety Department.

The sharp drop in manufacturing investment in France has prevented SNPE Engineering from writing a normal amount of orders, and 1993 looks to be a difficult year.

#### VI - Financial and Accounting Data; Draft Resolutions

1992 accounts were closed in accordance with the provisions of the General Accounting Plan, using the same criteria as for the previous year's balance sheet.

As in previous years, no monies were set aside to cover the cost of a dispute with a foreign customer who is demanding reimbursement for engineering contract loans and for payment of interest on those sums. We challenge the validity of the customer's claim. There was no progress on the legal dispute during 1992.

We propose that the General Meeting allocate this year's loss of Fr22,032,352.51 by charging it to the paid-in capital disbursed in cash.

The appended accounting documents analyze the main financial transactions that occurred during fiscal year 1992.

SNPE's shareholders remained the same. The French state holds nearly all of its stock.

Note that, in conformance with the law, the year's accounts have been forwarded to the central worker-management committee for comment.

The General Meeting is also asked to authorize the Board of Directors to issue bonds worth no more than Fr500 million, once or several times, and to empower it to decide the terms of the bond issues.

The purpose of the bonds is to consolidate a portion of the short-term debt, funded through treasury bills, and to diversify the company's long-term resources.

In accordance with provisions of article 47 of the 12 July 1965 law No. 65-566, we remind you that the amount of dividends paid out over the last three fiscal years, and the amount of their corresponding dividend tax credits, were as follows.

Year	Net Dividends	Tax Credits
1989	Fr3,044,098.20	Fr1,522,049.10
1990	Fr9,339,846.75	Fr4,669,923.43
1991	none	none

## SNPE GROUP CONSOLIDATED ACCOUNTS 1992

## CONSOLIDATED BALANCE SHEET as of 31 December, 1992, ASSETS

ASSETS in FrThousands	31 December, 1992			1991 Fiscal Year
	Gross	Amortizations and provisions	Net	Net
<b>FIXED ASSETS</b>				
Uncalled, subscribed capital (0)	-	-	-	-
Intangible assets	441,030	179,178	261,852	160,893
Facility charges	3,367	3,367	-	-
Research & development charges	1,375	1,375	-	-
Franchises, patents, rights	84,543	28,611	55,932	7,149
Goodwill	115,429	28,807	86,622	20,766
Other intangible assets	57,287	52,750	4,537	9,540
Prepays	542	-	542	833
Acquisition variances	178,487	64,268	114,219	122,605
Tangible fixed assets	4,467,648	2,740,494	1,727,154	1,572,401
Land	128,060	33,992	94,068	89,207
Buildings	1,378,936	779,555	599,381	519,683
Technical installations, industrial equipment and tooling	2,519,399	1,696,370	823,029	757,587
Other tangible fixed assets	332,658	230,577	102,081	99,852
Fixed assets in-progress	101,512	-	101,512	90,551
Prepays	7,083	-	7,083	15,521
Long-term investment	127,474	22,593	104,881	110,614
Value of companies by equity method	3,733	-	3,733	3,669
Controlling interests	74,353	21,869	52,484	60,591
Receivables from controlled entities	5,919	-	5,919	4,742
Capitalized securities	24,078	136	23,942	23,945
Loans and other long-term investments	19,391	588	18,803	17,667
<b>TOTAL I</b>	<b>5,036,152</b>	<b>2,942,265</b>	<b>2,093,887</b>	<b>1,843,908</b>
<b>CURRENT ASSETS</b>				
Stocks and in-process inventory	1,480,929	230,092	1,250,837	1,447,588
Raw materials, merchandise, other supplies	428,634	67,992	360,642	379,169
Work-in-progress: goods	318,274	26,586	291,688	325,431
Work-in-progress: services	71,869	2,477	69,392	142,504
Semi-finished and finished products	662,152	133,037	529,115	600,483
Down-payments to suppliers	15,206	-	15,206	7,159
Accounts receivable	1,534,157	45,194	1,488,963	1,214,016
Trade accounts and notes receivable	1,087,232	43,783	1,043,449	1,009,329
Other receivables	446,925	1,411	445,514	204,687
Subscribed, called, unpaid capital	-	-	-	-
Various	227,664	-	227,664	164,466
Investment securities	77,204	-	77,204	42,539
Cash	150,460	-	150,460	121,927
Prepaid expenses	19,764	-	19,764	14,363
<b>TOTAL II</b>	<b>3,277,720</b>	<b>275,286</b>	<b>3,002,434</b>	<b>2,847,592</b>
<b>EXPENSES TO AMORTIZE (III)</b>	<b>1,729</b>	<b>-</b>	<b>1,729</b>	<b>2,352</b>
<b>DISCOUNTS (IV)</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>UNREALIZED LOSSES (V)</b>	<b>16,985</b>	<b>-</b>	<b>16,985</b>	<b>9,646</b>
<b>TOTAL ASSETS (0+I+II+III+IV+V)</b>	<b>8,332,586</b>	<b>3,217,551</b>	<b>5,115,035</b>	<b>4,703,498</b>

**CONSOLIDATED BALANCE SHEET as of 31 December, 1992, LIABILITIES**

LIABILITIES in FrThousands	31 December 1992	Fiscal year 1991
<b>EQUITY</b>		
Capital	282,357	276,736
Capital in excess of par	397,626	421,850
Excess of restated assets over historical costs	13,094	13,097
Legal reserve	17,098	17,098
Statutory or contractual reserve	-	19,107
Regulated reserves	64,993	40,707
Other reserves	-	130,679
Unappropriated earnings	-	-
Assets revaluation reserves	10,485	51,318
Consolidated reserves	329,215	242,840
Consolidated losses	-59,965	-127,080
Investment subsidies	2,867	3,537
<b>GROUP'S TOTAL NET LIABILITIES</b>	<b>1,057,770</b>	<b>1,089,889</b>
Minority assets revaluation reserve	926	129
Other consolidated minority reserves	73,385	17,334
Minority losses	-7,431	-1,149
<b>TOTAL MINORITY INTERESTS</b>	<b>66,881</b>	<b>16,314</b>
<b>TOTAL I</b>	<b>1,124,650</b>	<b>1,106,203</b>
<b>OTHER EQUITY</b>		
Proceeds from issues of controlling interests	-	3,411
Conditional loans	4,690	2,055
<b>TOTAL II</b>	<b>4,690</b>	<b>5,466</b>
<b>CONTINGENCIES &amp; LOSS PROVISIONS</b>		
Contingency provision	101,590	77,186
Loss provision	210,826	337,125
<b>TOTAL III</b>	<b>312,416</b>	<b>414,311</b>
<b>DEBTS</b>		
Convertible bonds	6,640	6,640
Other bonds	6,640	6,640
Loans, debts with credit institutions	1,184,430	1,025,647
Various financial loans, debts	712,298	434,594
In-process down-payments from clients	546,747	645,056
Trade notes & accounts payable	559,051	523,518
Tax and social liabilities	457,970	380,691
Payables to fixed assets suppliers & subaccounts	80,623	95,629
Other debts	110,286	55,714
Prepaid income	722	638
<b>TOTAL IV</b>	<b>3,665,457</b>	<b>3,174,767</b>
Unrealized gains (V)	7,822	2,751
<b>TOTAL LIABILITIES (I+II+III+IV+V)</b>	<b>5,115,035</b>	<b>4,703,498</b>



## CONSOLIDATED PROFIT &amp; LOSS STATEMENT, as of 31 December 1992

in FrThousands	France	Exports	Total as of 31 December 1992	Total Fiscal Year 1991
<b>OPERATING REVENUES</b>				
Sale of merchandise	427,098	216,741	643,839	548,962
Production sold: goods	1,596,129	1,284,652	2,880,781	2,955,208
Production sold: services	568,233	120,502	688,735	1,253,651
Net sales	2,591,460	1,621,895	4,213,355	4,757,821
*including foreign companies		447,355		
Increase in finished goods & in-house inventory (variation of products stock)			-184,180	-316,248
Self-production			22,192	27,320
Operating subsidies			16,541	15,018
Excess depreciation charges & provisions cancellations			302,593	317,677
Other proceeds			10,340	13,652
Expense transfers			125,558	
<b>TOTAL OPERATING REVENUES (I)</b>			<b>4,506,399</b>	<b>4,815,240</b>
<b>OPERATING CHARGES</b>				
Merchandise purchases (including customs duties & ancillary fees)			263,675	234,046
Purchase of raw materials & other supplies (including customs duties & ancillary fees)			883,570	990,498
Stocks variation (raw materials, supplies, merchandise)			-732	-23,127
Other purchases & external charges			1,001,474	1,081,135
Taxes, levies & duties			169,758	239,605
Wages & salaries			1,118,148	1,140,751
Social security charges			454,454	476,287
Operating allowances				
On fixed assets: depreciation allowance			307,395	291,209
On fixed assets: provisions			-	7
On current assets: provisions			239,837	246,261
Contingencies & losses: provisions			62,582	57,912
For operating charges to amortize			-	-
Other expenses			19,244	9,895
<b>TOTAL OPERATING CHARGES (II)</b>			<b>4,519,405</b>	<b>4,744,479</b>
<b>OPERATING PROFITS &amp; LOSSES (I-II)</b>			<b>-13,006</b>	<b>70,761</b>
<b>JOINT OPERATIONS</b>				
Earnings distributed or loss transferred (III)			-	-
Loss sustained or profits transferred (IV)			-	-
<b>FINANCIAL PROCEEDS</b>				
Financial proceeds of controlling interests			9,221	7,345
Financial proceeds of other investment securities			160	405
Other interest income			11,268	11,311
Cancellation of financial provisions & charge transfers			7,449	22,640
Foreign exchange gains			22,859	10,116
Net proceeds on sale of investment securities			552	788
<b>TOTAL FINANCIAL PROCEEDS (V)</b>			<b>51,509</b>	<b>52,604</b>
<b>INTEREST EXPENSES</b>				
Financial depreciation allowances & provisions			11,705	3,831
Interest expenses			172,770	126,706
Foreign exchange losses			13,555	10,056
Net charges on sale of investment securities			-	3

**CONSOLIDATED PROFIT & LOSS STATEMENT, as of 31 December 1992 (Continued)**

in FrThousands	France	Exports	Total as of 31 December 1992	Total Fiscal Year 1991
TOTAL FINANCIAL CHARGES (VI)			198.030	140.596
FINANCIAL LOSSES (V-VI)			-146.521	-87.993
CURRENT BEFORE-TAX LOSSES (I+II+III+IV+V+VI)			-159.527	-17.232
EXTRAORDINARY INCOME				
Extraordinary income on management operations			112.840	69.083
Extraordinary capital income			60.207	31.788
Cancellation of provisions & charge transfers			99.885	7.969
TOTAL EXTRAORDINARY INCOME (VII)			272.932	108.840
EXTRAORDINARY CHARGES				
Extraordinary charges on management operations			140.674	33.872
Extraordinary capital charges			31.892	11.253
Extraordinary depreciation allowances and provisions			39.964	203.452
TOTAL EXTRAORDINARY CHARGES (VIII)			212.530	248.577
EXTRAORDINARY PROFITS/LOSSES (VII-VIII)			60.402	-139.737
Employee profit-sharing			5.081	14.217
Income tax			-36.811	-42.962
TOTAL PROCEEDS			4.830.840	4.976.683
TOTAL CHARGES			4.898.234	5.104.912
NET LOSSES OF INTEGRATED COMPANIES			-67.460	-128.547
Share of companies using equity method			64	318
NET LOSSES OF CONSOLIDATED WHOLE			-67.396	-128.229
SNPE Group's share of net losses			-59.965	-127.080
Net losses of minorities			-7.431	1.149

**TABLE OF CONSOLIDATED INCOME STATEMENT INTERMEDIATE BALANCES as of 31 December, 1992  
(in FrThousands)**

SALES (1)		CHARGES (2)		INTERMEDIATE BALANCES (1-2)	Fiscal year 1992	Fiscal Year 1991
Headings	Amounts	Headings	Amounts	Headings	Amounts	Amounts
Production sold (including merchandise)	4,213,355					
Increase in finished goods & in-house inventory	-184,180	or decrease in inventory	-			
Self-production	22,192					
TOTAL	4,051,367	TOTAL	-	PRODUCTION OF THE PERIOD	4,051,367	4,468,892
Production of the period	4,051,367	Third-party consumption of the period	2,147,987			
TOTAL	4,051,367	TOTAL	2,147,987	ADDED VALUE	1,903,380	2,186,340
Added value	1,903,380	Taxes & levies	169,758			
Operating subsidy	16,541	Personnel charges	1,572,602			
TOTAL	1,919,921	TOTAL	1,742,360	OPERATING CASH FLOW	177,561	344,715
Operating cash flow	177,561	or operating cash deficit	-			
Operating recovery & charge transfer	428,151	Operating depreciation allowances and provisions	609,814			
Other sales	10,340	Other charges	19,244			

**TABLE OF CONSOLIDATED INCOME STATEMENT INTERMEDIATE BALANCES as of 31 December, 1992**  
(in FrThousands) (Continued)

SALES (1)		CHARGES (2)		INTERMEDIATE BALANCES (1-2)	Fiscal year 1992	Fiscal Year 1991
TOTAL	616,052	TOTAL	629,058	OPERATING PROFITS/LOSSES	-13,006	70,762
Operating profit	-13,006	or loss	-			
Share of operating profit	-	Share of operating deficit	-			
Financial proceeds	51,509	Interest expenses	198,030			
TOTAL	38,503	TOTAL	198,030	CURRENT PROFITS/LOSSES	-159,527	-17,236
Extraordinary proceeds	272,932	Extraordinary charges	212,530	EXTRAORDINARY PROFITS/LOSSES	60,402	-139,738
Current profits/losses	-159,527	Employee profit-sharing	5,082			
Extraordinary profits/losses	60,402					
		Income taxes	-36,811			
TOTAL	-99,125	TOTAL	-31,729	PROFITS/LOSSES OF THE PERIOD	-67,396	-128,229
Proceeds from sale of assets	57,166	Net accounting value of assets sold	31,152	Capital gains or losses on sales	26,014	18,251

**SUMMARY OF USES AND RESOURCES (in FrThousands) as of 31 December 1992**

USES	FISCAL YEAR 1992	FISCAL YEAR 1991	RESOURCES	FISCAL YEAR 1992	FISCAL YEAR 1991
Dividends paid	-	15,287			
TOTAL I	-	15,287			
Charges to amortize	102	1,277	Cash flow	229,954	110,321
TOTAL II	102	1,277	TOTAL I	229,954	110,321
Acquisition of assets			Sale or reduction of assets		
Intangibles	123,622	13,500			
Prepays on intangible fixed assets	192	705	Intangible fixed assets	9,202	25,922
Tangible fixed assets	495,623	356,819	Prepays on intangible fixed assets	412	134
Prepays on tangible fixed assets	4,145	8,066	Tangible fixed assets	25,106	5,381
Goodwill	7,979	72,293	Prepays on tangible fixed assets	12,859	4,838
Financial fixed assets	3,870	70,970	Financial fixed assets	32,681	3,720
TOTAL III	635,431	522,353	TOTAL II	80,260	39,995
Equity reduction	10,879	1,453	Increase in equity	96,883	13,379
TOTAL IV	10,879	1,453	TOTAL II	96,883	13,379
Debt reimbursement	191,533	103,743	Debt increase	307,074	374,062
TOTAL V	191,533	103,743	TOTAL IV	307,074	374,062
Foreign exchange unrealized gains/losses	208	666	Foreign exchange unrealized gains/losses	393	409
TOTAL VI	208	666	TOTAL V	393	409
TOTAL OF USES (I+II+III+IV+V+VI)	838,153	644,779	TOTAL OF RESOURCES (I+II+III+IV+V)	714,564	538,166
Increase in working capital	-	-	Decrease in working capital	123,589	106,613

**DEBT MATURITY STATUS AT END OF FISCAL YEAR, as of 31 December 1992 (in FrThousands)**

DEBTS	Gross amount	Maturity within 1 year or less	Maturity 1+ to under 5 years	Maturity 5+ years
Bonds	13,280	-	5,691	7,589
Loans, debts with credit institutions	1,184,431	470,892	616,191	97,348
Various financial loans, debts	712,299	655,208	29,668	27,423
Operating accounts payables & subaccounts	559,051	543,625	15,426	-
Personnel and subaccounts	114,583	113,768	815	-
Social security & other social organizations	124,236	122,960	1,276	-
State & other public collectivities	219,150	217,882	1,268	-
Debts on fixed assets & subaccounts	80,623	80,235	388	-
Other debts	110,286	105,230	5,056	-
Prepaid income	772	597	175	-
TOTAL EXCLUDING IN-PROGRESS DOWN-PAYMENTS FROM CLIENTS	3,118,711	2,310,397	675,954	132,360

**Bull 1992 Annual Report**

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[Annual report of Compagnie des Machines Bull: "Bull in 1992"]

[Text]

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**Message from President**

1992 was a very difficult year for Bull [CMB]. Management was unable, despite company-wide exertions throughout the year, to meet its assigned objective of restoring financial equilibrium. Account reserves set aside to carry out the restructuring measures required weighed heavily on the company's finances.

That said, the progress achieved should not be underestimated:

- Managerial efficiency was improved significantly: 13.9 percent drop in administrative and marketing overhead, 44 percent reduction in operating loss while supporting a 3.7 billion French franc [Fr] research and development [R&D] program, and Fr1.5 billion reduction in debt;
- Conclusion of a technical cooperation accord with IBM, combined with IBM's acquisition of a minority interest in the company, enabled CMB to launch on the market, in record time, a Unix platform running on the "Power" RISC [reduced instruction set computer] microprocessor;
- Subsidiary Zenith Data Systems's newly launched line of microcomputers was universally hailed as one of the most advanced on the market;
- New products were added to support the Distributed Computing Model [DCM].

Like many of its longtime competitors, Bull is being buffeted by market turbulence, but it has a compass to guide its client service. Its technical know-how is well adapted to such new market needs as expanded computer networks and

distributive architectures, and it has a high-quality product line and loyal, worldwide clientele base that in 1992 reaffirmed its confidence in Bull.

Bull boldly committed itself to a course of far-reaching redeployment to adapt to new market conditions. At the same time, it continued efforts to cut costs.

Our primary shareholders showed their confidence in Bull's potential in late 1992 by allocating a shareholder advance of Fr2.5 billion to be added to the company's capital structure.

I am certain that concerted efforts by all Groupe Bull personnel will get it back on the road to success, once problems associated with current economic conditions have been left behind.

[Signed] Bernard Pache, president-general manager.

**Difficult Year**

Like most big manufacturers, Bull in 1992 encountered both short-term and structural problems.

The global slowdown in economic activity, clearly felt in the second half of the year, reduced business investment, especially in Europe.

In this depressed economic environment, the structural metamorphosis of the data processing market noted at the beginning of the decade accelerated.

Clients now expect complete solutions, not just platforms. Their decisions are made primarily on the basis of the efficiency, profitability, and competitive advantages they can derive from a given information system.

Distributed computing, which facilitates decentralization of responsibilities within an enterprise, improves company responsiveness to conditions in the field, and streamlines structures, is increasingly widespread. More and more, systems are linking up proprietary and standard servers with microcomputers to integrate diverse hardware and software. Underlying this trend are the increasing power of microprocessors, the growing popularity of Unix and RISC architecture as a market standard, the development of numerous communications infrastructures and protocols, and the proliferation of software available on these architectures.



Competition has intensified, which has greatly eroded profit margins.

Microcomputing is the domain where this competition has led to expanded price wars. In fact, the annual rate of price decline, which used to be 20 to 25 percent (reflecting changes in productivity), reached levels of 40-50 percent in 1992. That affected the turnover and profits of our microcomputer subsidiary, Zenith Data Systems, which at the time was launching a new line of products whose ease of installation and use on networks was recognized by everyone.

Bull, which had anticipated this market trend in its November 1990 Plan for Change, is strengthening and accelerating its rationalization and its technological and commercial repositioning.

#### **Vigorous Action**

The measures taken in 1992 continued to follow the lines established in the program adopted in 1990.

Since then, Bull has concentrated its efforts on the following objectives:

- development of a technical plan to give Bull a leading position in distributed architectures;
- reinforcement of the policy of partnerships and technological cooperation that allows development costs to be shared;
- rationalization of manufacturing plant;
- cost reduction.

In all these areas, the enterprise has taken decisive action and made significant progress, though more remains to be done.

Despite a decline of close to 10 percent in turnover, gross profit margin has remained constant at 36.4 percent of sales, even though the computer industry is suffering from intense downward pressure on prices, which in turn squeezes profit margins.

Production teams, concentrated now at five principal sites (there were 13 in 1990) in factories specialized by product line, have continued their adaptation efforts. The total cost of inputs and production decreased by about Fr500 million, based on the volume of activity in 1992.

Distribution and administrative costs were reduced by 13.9 percent, or Fr1.45 billion. All the Bull organizations participated in this effort.

Operating losses were reduced from Fr1,154 million in 1991 to Fr642 million in 1992, or about 2 percent of turnover for the year.

This progress inevitably entailed reducing the work force by 4,700 people, but the reduction was carried out with respect for the dignity of company employees.

The strengthening of the company's alliances in 1992 shows that world-class players in the data processing sector continue to have confidence in Bull's future.

NEC, a partner in the Group for more than 30 years and a CMB shareholder since November 1991, subscribed its full share of CMB's June 1992 capital increase. As of 31 December 1992, NEC held a 4.4 percent interest.

IBM, with which Bull has joined forces for strategic code-development of Unix multiprocessors, acquired a 5.7 percent interest in CMB in a closed capital increase in June 1992.

But these two important accords should not lead us to ignore other partnerships (with StorageTek for example) which are equally important for Bull's clients and which illustrate the company's attractiveness.

Alliances are more necessary than ever, because the cost of technology development is forcing industries in the data processing field to share the burdens.

Inasmuch as telecommunications system operators today are the largest clients of the data processing sector, France Telecom's 16.2 percent interest in CMB assumes a strategic dimension that should prove profitable to both enterprises.

#### **Distributed Computing**

Information systems that integrate enterprise host computers, servers, and work stations that are at once distributed and heterogeneous are of major importance in today's world. Increasingly, computer applications extend beyond the boundaries of the individual company and operate interactively with the systems of clients, suppliers, and partners.

Thus Bull is concentrating its efforts to further enrich its Distributed Computing Model, which gives the company a leadership position in distributed infrastructure and open systems.

Its GCOS host computer offerings have shown new strength on the market. After the 1990 launching of high-end DPS 7000 (500 and 700), Bull in 1992 began marketing its DPS 7000/400, which came with a new version of the V6 operating system. As an entry-level GCOS 8 offering, the first DPS 9000/500 were delivered in late 1992.

In a follow-up to the 27 January 1992 accord signed with IBM, Bull announced (27 April 1992) and put on the market (June 1992) a line of Unix platforms, the DPX 20, equipped with the "Power" RISC microprocessor and running under the AIX operating system. This IBM-based platform was enhanced with new functionalities, especially in terms of interoperability, that make it the best integration platform on the market.

The new "Series Z" line from Zenith Data Systems, equipped with Intel 486 microprocessor and running under the MSDOS/Windows operating system, demonstrated its connectivity capabilities and ease of use not only for work stations and servers but also for portables.

In regard to system architecture, DCM was enriched with a system administration software package, ISM (Integrated System Management). It stands out from competing utilities by offering system administrators for the first time a comprehensive picture of the status of the information system and power to intervene with equal ease anywhere on systems of any level of complexity. From his work station, he can directly access networks, servers, work stations, and microcomputers, verify the volume of available computing power, and intervene directly to ensure optimal allocation of resources.

By virtue of its capacity to accommodate the increasing complexity of information systems, the Distributed Computing Model facilitates a sectoral approach. Major product announcements were made in 1992, such as DCM Manufacturing and DCM Banking, which allows all banking applications to communicate with each other whether or not they run on Bull platforms.

A DCM Partners association created to facilitate cooperation with service companies has more than 60 member partners working on a hundred or so projects to enrich the pool of DCM applications.

#### **New Impetus**

Zenith Data Systems's European marketing teams have been integrated into the Bull sales network to ensure they benefit fully from the Group's marketing resources in the field. The growth of sales seen in early 1993 confirms the wisdom of this reorganization.

To better understand and satisfy our clients' changing demands, the marketing apparatus is being beefed up. A new "Bull Strategy Marketing and Business Development" division has this as its objective, to be accomplished among other things by concentrating its efforts in sectors where Bull enjoys a strong position. It will also work to foster growth of new markets in which Bull has unique technological capabilities—smart cards, physical and logical data security, point-of-sale [POS], and branch banking, for example.

It is in this context that a center of international expertise for big telecommunications operators was created.

Development of standard platforms and software requires that Bull's product offerings be coupled with expert service.

A four-pronged policy to redeploy our service expertise has been launched:

- move from traditional maintenance activities on Bull proprietary systems toward providing all services directly tied to products: multivendor services, third-party maintenance, installation and support of LANs [local area networks], clustering, etc.
- expand professional service activities in areas where Bull has a strong background.
- accelerate the growth of systems integration activities by concentrating on technology-heavy projects backed by the software expertise of SSIs [computer systems and services firms]. This activity now involves more than 1,000 of the company's employees, and the Gartner Group has ranked Bull number four in Europe and number six in the world.
- move into "facilities management," to directly administer clients' information systems, factoring client costs, deadlines, and profits into the equation.

This policy was translated into operational terms by the decision to make Systems Integration and Facilities Management a separate division, giving its head a position on the steering committee.

To accelerate the adaptation of costs to market constraints, several Group-wide work sites have been established to economize on office real estate, logistics, information systems, purchases, etc.

In that context, it was decided to group Bull's 15 Paris-area facilities on six sites, among other things by moving CMB's headquarters to the Bull Tower on La Defense.

Development of multidisciplinary work teams allows us to be optimally responsive to clients, in the spirit of empowerment and service. In the same spirit, we are developing a profit-center structure for sales units and product lines.

#### **Prestige Contracts**

In 1992, Bull won prestigious contracts attesting to the success of its redeployment toward open, distributed infrastructures and services, while maintaining a high level of activity and quality on its big GCOS host computers for business and industry.

Numerous clients already have adopted the Distributed Computing Model and software solutions adapted to their needs.

The same is true in the world aeronautics sector, a highly competitive environment.

In Belgium, Eurocontrol, which is responsible for Europe's air traffic control system, has opted for the Distributed Computing Model. This complete information system, developed by Bull in partnership with Trasys (which provided the software), includes two DPS 7000 to handle the large volume of information plus the Oracle relational database management system. Information is circulated by two of Bull's Unix DPX servers and close to 150 Zenith Data Systems microcomputers.

In another sector, chemicals, Chevron Chemical Company has retained Bull to ensure direct and rapid communication between systems running under five different operating systems and to provide for connectivity of these systems to the US-based parent company, which uses hardware from another manufacturer.

In 1992, Bull also acquired prestige clients in systems integration. In Great Britain, we won the confidence of the British Army in its Project Unicom designed to ensure homogenous, high-security management of 550 installations located all around the world. Competing with Bull for this contract, which will bring in 100 million pounds sterling over a 4-year period, were the world's largest integration specialists; our success was the fruit of a policy of cooperation with service companies at the national level—in this instance, Logica, the top British SSI.

At the same time, Project IRON, designed to assure interoperability between the British government's 632 tax centers, has reached the final stage with installation of the project's data processing infrastructure, which required 900 Bull DPX servers and 2,500 microcomputers valued at 50 million pounds sterling.

In France, the Flight Testing Center (CEV) for military and civilian aircraft, in order to enhance competitiveness vis-a-vis other European centers, has made Bull responsible for Project Sigma, which concerns test planning and fleet maintenance management. This contract, valued at Fr80 million, for which Bull is the prime contractor, is 80 percent services.

In addition, we have won big "multivendor services" contracts. For example, Bull teams in Australia were chosen by Westpac Banking Corp. to maintain and upgrade non-Bull systems.

### Specific Expertise

1992 was the year of international breakthrough for our automatic banking products.

In Asia, where our American and Japanese competitors hold a predominant position, we placed 400 ATM orders.

In Taiwan, Bull is the only firm to have developed ATMs with chip card readers meeting the specifications of the Taiwanese Finance Ministry. China's second largest bank, Industrial Commercial Bank, ordered its first 79 ATMs from Bull.

On the East Europe market, we installed the first ATMs in St. Petersburg, at Sberbank's Kirov branch.

In the field of artificial intelligence [AI], Bull today is one of the three world leaders. We are involved in the development of numerous international projects, and our CHARME software (parameter programming computer language) has been used in Japan.

AI was also used at the winter Olympic Games in 1992 at Albertville (France), where the Ramses system developed by Bull helped provide security by optimizing risk management for the DIJO (Interministerial Delegation to the Olympic Games). Numerous clients are interested in tailored implementations of this system.

Security was also the dominant concern that led organizers of the Seville World Fair in 1992 to choose the CP8 smart card. Access to "Expo 92" was controlled by CP8 cards containing biometric identification data including digitized fingerprints of exhibitors and site personnel. Bull CP8, a Bull subsidiary, is the world leader in design of integrated microcomputer cards (so-called "smart cards"), on which it holds almost all the patents.

The competitiveness of our big host computers for business and industry has been reconfirmed. The insurance firm La Mondiale, whose information system is built around a Bull DPS 9000/61 main-frame, is the most eloquent example. La Mondiale began installing "Infoservice" in 1988. Today, relational database management is provided by Bull's GCOS 8 operating system. Transaction management is provided by TP8 and the Pacbase software engineering workshop. Infoservice, which went on-line in 1991, has put an end to vexing procedures that often involve excessive response times.

The municipality of Birmingham, England, has replaced a non-Bull system with the Bull DPS 7000. Our ability to offer a complete solution meeting client needs—and the offer of real partnership—were the primary factors responsible for success.

Our new Unix RISC product line posted successes in the most diverse domains in 1992. In the area of distribution, for example, Conforama signed a contract for 150 DPX 20 in the "MERCURE" hardware-software package for its 150 POS in France. Bull took this contract against numerous competitors because it paid close attention to the client's

needs and was able to offer an integrated solution (store marketing management from purchase to sale, including inventory).

Of all the market successes won by our Zenith Data Systems microcomputers, the most notable is that of the US Air Force "Desktop IV": This contract involves delivery of 300,000 desk computers over a 3-year period, for a total of \$724 million. This decision was reconfirmed by the US Air Force in January 1993, despite continuing bureaucratic maneuvers by some of our competitors.

Yonkers, the fourth largest city in the state of New York, chose Bull and the DPS 7000 to rationalize management of its municipal violations files. Transparency, streamlined updating, and ease of real-time access to data were among factors that led to acceptance of the solution we offered in partnership with Associated Data Processing, which provided the software.

These successes and prestige contracts are examples of the competitiveness of our products and services, and they rest on the capacity of our teams to respond to changing client expectations.

### Prospects

It is primarily by relying on our capacity to meet client expectations while continuing to cut costs that Bull intends to reestablish the basis of durable profitability.

Bull's plans reflect those of its clients. Stimulated by competitive pressures, enterprises are changing, working more closely with their own clients, and refining the quality of their response. They are concentrating on the key value-added processes unique to their field. Government bureaucracies have a growing need for communication at both the national level and, in the case of big regional economic blocs such as Europe, the international. The problems in the data processing industry are thus related more to change than to saturation of demand; new needs are appearing.

Our clients expect their information system to contribute actively to competitiveness by speeding up and facilitating their response to market changes.

The concern for adaptability becomes critical for organizations such as government agencies, public utilities, banks, and insurance companies, which manage a very large volume of data and clients.

Data management is thus becoming the foundation of really functional systems based on new organizational modes. Bull, for example, can:

- help banks increase the density and availability of their "points of client contact" by deploying ATM networks;
- enable insurance companies to give clients real-time information on the status of their account;
- give electricity distribution clients the ability to service residential customers inside a 2-hour window.

To increase clients' profits, Bull helps them find the best way to capitalize on their information by making available its own expertise and the tools they need to serve their customers.

Bull has always excelled above all in data processing "architecture" and in integration of information-serving technologies: database design, multiprocessing, big-system architecture, etc.

Today, this expertise is being applied also at another level: that of client information systems consisting of multiple platforms of varied origin.

With its Distributed Computing Model, Bull sells data processing infrastructures and advanced tools that allow clients to build or upgrade information systems from the simplest to the most complex. With Bull, enterprises get reliable, high-performance business servers to run their strategic software systems and process information about their own clients. These servers handle both transaction processing and relational database management:

- Interrel for the GCOS 8;
- Oracle for GCOS 7;
- DBA-Expert for relational database management;
- Informix, Ingres, and Oracle for the DPX 20, Bull's Unix.

Communications software:

- an OSI [Open Systems Intercommunication] base adapted for communication between Bull and non-Bull systems;
- Affinity, which simplifies work-station access to company databases;
- OpenTeam, which links up and integrates previously installed LANs;
- Interoperability software compliant with international protocols and standards;
- OfficeTeam, which allows the user to benefit from an advanced e-mail system on his own microcomputer and provides connectivity with all existing systems on the market;
- EDIWorks for computerized data exchange on inter-company networks;
- ImageWorks for transfer, management, and storage of data, voice, and image, enhanced in 1992 by a number of supplementary utilities, notably client data management software.

Network administration utilities:

Integrated Systems Management, which meets the need to decompartmentalize businesses by allowing the system administrator to intervene remotely, directly, and simply anywhere in the information system to optimize its performance.

#### **Robust, Reliable**

To assure the continued usefulness and upgradability of applications developed for our GCOS 8 clients, we will remain closely involved in big business servers. In 1992 we put on the market the entry-level DPS 9000/500 and announced one of the world's most powerful management computers with Project "ZEUS."

Since 1990, we have restructured our line of GCOS 7 hardware and software products.

Over the longer term, Bull is concentrating its efforts on large database accessibility, from the dual standpoints of performance and protection of client investments, by mobilizing external expertise in the field of peripherals.

For Unix, we have marketed in cooperation with IBM a new line of Bull DPX 20 platforms that incorporate the core of our communications expertise. These computers are the most fully representative of our systems integration know-how and will be further enriched by our multiprocessor technology to augment performance and data security.

The microcomputers built by our subsidiary, Zenith Data Systems, enhance business information management systems with their connectivity and the most commonly used man/machine interface. They place the user at the center of his information system.

Along with platforms, we offer high-quality software and services. Our clients are thus assured of getting the best technology in the world, information systems upgradability, and protection and profitability of their investments.

Database accessibility and circulation of information are the key selling points for our product lines.

#### **Future Technologies**

Building on its existing expertise, Bull is concentrating its developments in domains with strong prospects for growth.

- Electronic documents: Bull offers advanced utilities to integrate electronic document flow within information systems—ImageWorks for electronic document management and "FlowPATH" for document file tracking, for example.
- For client contacts, Bull offers a broad range of solutions, such as BRISE POS stations, automatic tellers, and electronic fund transfers at ATMs.
- Microprocessor cards: The card developed by our subsidiary Bull CP8 is the leading "smart card"; Bull has an unmatched portfolio of patents in this technology, which makes it possible to personalize and safeguard access to large information systems in an optimal manner. The credit card was the first mass development of this technology, but others are on the way—health cards, student cards, pay television cards, etc.
- Artificial intelligence: Bull is a leader in this domain and intends to keep its position, concentrating the efforts of development teams on parameter programming languages and object-oriented technologies. Bull has two flagship products in CHARME and KOOL.

Bull's research teams are also focusing on high-demand areas such as:

- tools for software development on heterogeneous platforms;
- multimedia tools for integration of animated images in the business environment;
- object-oriented management of knowledge bases, integrating deductive mode with distributed environments in object-oriented applications.



Despite short-term constraints, Bull is maintaining and continuing to improve its technical expertise and intends to retain the technological excellence which has always been its biggest asset.

Our clients expect data processing infrastructures to be flexible, reliable, and user-friendly. The search for ways to cut costs leads them increasingly to hardware and software with high connectivity. Integration of these products into business information systems requires us to provide secure and comprehensive service.

To meet these new expectations, Bull is actively engaged in expansion of on-site and professional services, especially systems integration services. Also, we are expanding "facilities management," which consists of taking responsibility for all or part of a client's information system and meeting specific commitments in terms of costs and deadlines. We are also increasing our capacities in the field of computer plant maintenance (Bull and non-Bull equipment).

Improvement of Bull's profit margin and efficiency also presuppose further rationalization of its assets worldwide.

Bull is going to continue to improve the competitiveness of its industrial plant by sizing it to meet the needs, increasing factory specialization, and developing services for other computer makers.

Commercial networks will also be rationalized; new sales methods are going to be put in place, such as telemarketing and development of multidisciplinary teams drawing on all areas of in-company expertise to help clients accomplish their objectives.

Implementation of this strategy implies profound changes throughout the enterprise. Specific objectives and a rigorous training program will help all our personnel to advance, either in their current field or in fields of the future.

In domains where the level of activity stagnates, the inevitable position cutbacks will be carried out locally with all possible respect for individuals, taking pains to guide them toward personally positive outcomes.

By moving ahead with the necessary cost reductions and repositioning itself as a technology integrator and information system builder for its clients, Bull is giving itself the tools it needs to lay the foundations for durable profitability.

#### Financial Performance

1992 was marked first of all by a 9.8 percent decline in turnover, about one-third of which was due to variations in currency exchange rates. A great deal of the decline was attributable to the approximately 15 percent reduction in

equipment sales, income from services remaining stable and even showing (except for maintenance) some growth over 1991. It should be noted that sales of high-end GCOS 8 were resistant to the overall trend of declining revenue on platforms.

Despite the drop in turnover, gross profits as a percentage of revenue held up, thanks to substantial productivity improvements. Overhead associated with distribution and administration again declined sharply, with costs in these areas cut by Fr1.455 billion from 1991. Research and development costs subsided slightly—by Fr139 million in gross value and Fr241 million in net.

Overall costs for the year were cut by Fr2.5 billion, leading to an improved operating balance, despite declining prices and volume. The operating loss was Fr642 million, which represents a 44 percent improvement from 1991, and a 73 percent improvement from 1990.

Setting aside funds for restructuring, and especially taking into account financing costs, net operating loss for the period was Fr2,274 million. A Fr2,450 million provision having been set aside to cover the companion measures needed for restructuring, net loss for the period was Fr4,724 million.

The provision includes Fr1,450 million for specified measures and Fr1 billion for companion measures and coverage against risks posed by changing market conditions.

Also, significant efforts were made to diminish the volume of working capital, which was cut by Fr1.5 billion during the period, with inventories dropping from 10.2 percent of turnover in 1991 to 8.9 percent in 1992, and client payables decreasing in step with turnover. By the end of the year, net indebtedness, though still high, fell by Fr1.5 billion.

In 1992, CMB stockholders' equity was increased with an open stock issue of Fr2 billion (including a Fr1 billion issuing premium), to which NEC subscribed up to the limit of its participation, and a closed capital increase for IBM of Fr540 million (including a Fr315 million issuing premium). As of 30 June, on completion of the latter move, IBM owned 5.68 percent of CMB's stock.

The Group financial statement for 31 December 1992 includes an irrevocable shareholder advance of Fr2.5 billion. This advance from the French government and France Telecom, approved at the end of 1992 and disbursed in early 1993, is to be capitalized, and interest earned will also be assimilated as capital. It appears in the debit column under the category of "other equity capital." The consolidated total of equity capital plus capital assimilated after posting of the 1992 financial statement is slightly up from the previous period.

**Key Statistics for Groupe Bull<sup>1</sup>**

(figures in millions)	1990 (Fr)	1991 (Fr)	1992 (Fr)	1992 (US\$)
<b>Simplified Consolidated Profit-and-Loss Statement</b>				
Turnover	34,580	33,450	30,187	5,702
Gross profit	12,105	12,180	10,996	2,077
Net R&D	2,989	2,873	2,632	497
Commercial, administrative overhead	11,467	10,461	9,006	1,701
Operating profit/loss	(2,351)	(1,154)	(642)	(121)
Net financing costs	(1,120)	(1,346)	(1,332)	(252)
Provision for restructuring	(3,952)	(675)	(2,450)	(462)
Non-operational and minor	633	(126)	(300)	(57)
Net profit/loss	(6,790)	(3,301)	(4,724)	(892)
Net profit before restructuring provision <sup>2</sup>	(3,168)	(2,626)	(2,274)	(430)
<b>Other Data</b>				
Cash flow (net profits + amortizations)	(246)	198	334	63
Physical investments	2,927	1,880	1,394	263
of which industrial/commercial:	1,391	1,096	835	158
Inventory as of 31 December	5,357	3,413	2,689	488
Client payables as of 31 December	9,151	7,812	7,030	1,277
Net debt as of 31 December <sup>3</sup>	11,003	10,937	9,436	1,714
Total R&D outlays	3,747	3,853	3,714	702
Employees as of 31 December	44,476	39,878	35,175	35,175

1. The designation Bull or Groupe Bull includes all CMB subsidiaries and part-ownerships. Dollar totals appearing in the above chart were obtained by converting French francs at the average exchange rate for the year as published by OECD [Organization for Economic Cooperation and Development] (US\$1 = Fr.294), except for figures from the profit-and-loss statement, which were converted at the rate obtaining as of 31 December (US\$1 = Fr5.5065).

2. Net profit/loss (Group share) before provision for restructuring.

3. Excludes subordinated obligations of indeterminate duration (TSDI)

**1992 Turnover Breakdown**

By geographic zone, 38 percent of sales were in France, 36 percent elsewhere in Europe, 20 percent in North America, and 6 percent in the rest of the world.

By type of revenue, 54 percent came from equipment sales, 25 percent from client services, 19 percent from professional and software services, and two percent from miscellaneous sources.

**1992 Manpower Breakdown**

As of 31 December 1992, 42 percent of employees were in France, 28 percent elsewhere in Europe, 25 percent in North America, and 5 percent in the rest of the world.

Again as of 31 December 1992, 33 percent of employees were in marketing or professional services, 23 percent in client services, 29 percent in manufacturing and R&D, and 15 percent in administration.

**Renault, ABB, Robot Sales to Auto Industry Up**

Paris *PRODUCTIQUE/AFFAIRES* in French  
20 Sep 93 p 1

[Unsigned article: "Large Robot Orders for Renault Automation and ABB Robotique"]

[Text] While robot sales still seem to be in a slump, Renault Automation, the specialized subsidiary of the French manufacturer ABB Robotique, third in the world market, has landed several large contracts in a row in the automobile field. Renault Automation will deliver 350 of its new generation robots to the PSA group and to Renault from now until the middle of next year. ABB Robotique, for its part, will deliver to the General Motors plants in Europe its first-time order of over 200 robots to equip the group's plants in Germany, Belgium, Sweden and Great Britain in the course of next year. GM's selection of ABB is also based on the availability of a whole gamut of engineering services along with the products, as well as on the strong local ABB presence in each of the European countries where GM has settled. The IRB 6,000 robots in question are mostly intended for spot welding applications. Large orders of the same kind were placed a few months ago by the three main North American manufacturers, Chrysler, Ford, and GM. The worldwide activity of ABB in robotics represents a business volume of \$350 million in 1992 for 1,900 people. The first six months of the year showed a clear increase of five percent compared to the first semester of last year. In France, the group's robotics activity achieved a business volume of 162 MF in 1992 with a work force of 150 people. The worldwide ABB inventory amounts to 33,000 installed robots, including 2,000 in France.

ABB Robotique (Guy Micoulet) 22 rue du 8 Mai 1945, BP 118, 95340 Persan. Tel (1) 30.28.60.00.

**Netherlands: Fokker Faces Falling Orders***BR0810154293 Amsterdam DE VOLKSKRANT  
in Dutch 8 Oct 93 p 2*

[Unattributed article: "Fokker Studies Reorganizing F-50 Production"]

[Text] Amsterdam—Fokker will have to thoroughly reorganize its production of the Fokker-50 turboprop unless the market picks up soon. This year the company has sold just two F-50's and fears that it will have 11 completed but unsold aircraft at the end of this year. These represent a capital of 300 million guilders, on which Fokker must pay interest.

A spokesman confirmed that Fokker recently set up a task force because sales results were very disappointing. The force is to report in December on how F-50 production can be reorganized. It is possible that Fokker will only build the aircraft to order, but the trade unions are afraid that the company could reduce production further still.

At the start of this year Fokker decided to lower its production numbers for the coming years. The number of F-50's built annually will drop from 27 to 20 and the number of F-100's from 59 to 40. This will lead to the loss of 2,100 jobs, including 1,400 compulsory redundancies. Both Fokker and the trade unions said that it was premature to speak of possible new redundancies. "But I am worried," said P. van Bers, of the FNV [Netherlands Trade Unions Federation].

At present Fokker is basing itself on the assumption that the lower production rhythm will be sufficient to come through the recession in the aviation sector in one piece. Further cutbacks and job losses would take the company below the minimal, critical size. The task force was formed because the company cannot afford to build an unlimited number of unsold F-50's.

According to the Fokker spokesman, the market is being studied anew to see whether production can be reorganized, as has been done for F-100's. For this plane, only fuselages are being produced from stock. The expensive engines and cockpits, which are made by other companies, are only fitted when a buyer has been found. The planes can be delivered in four months.

Since the fuselages represent only a quarter of the value of an aircraft, completing construction to order saves Fokker large amounts in interest charges. However, this applies to a far larger degree to the F-100—which is selling fairly well—than to the F-50. After all, the F-50 is cheaper than the larger jet and is built in smaller numbers.

If completion to order is introduced for F-50's as well, then Fokker will probably ask staff to work more flexibly. Discussions around flexibility in F-100 production have already been held with the unions. It would mean that workers work less hours if there are no orders, and make up the hours in extra work when an aircraft has to be completed.

**France: Numerous Cancellations of Airbus Orders Reported***BR0810145293 Antwerp DE FINANCIËLE-  
EKONOMISCHE TIJD in Dutch 6 Oct 93 p 10*

[Article signed GUM: "Disastrous Year for Airbus Industrie—Boeing Already Has Six Times As Many Orders"]

[Text] (TIJD)—The European consortium Airbus Industrie is in deep trouble. Airbus headquarters in Toulouse is receiving an increasing number of requests to delay or cancel deliveries, while new orders are only dribbling in. Unless a miracle occurs, the order book by the end of the year will contain only a fraction of the orders that the consortium boasted at the end of 1992. Moreover, each of the four industrial partners is saddled with severe financial difficulties.

The aviation industry is still a long way from emerging out of the deep crisis which has dogged it for two years now. Aircraft manufacturers have already taken the necessary steps and thousands of jobs have been lost or will be axed in the coming months. Despite this, to a large extent they could still make do with the gigantic orders that preceded the Gulf War, but the rising tide of canceled orders or requests to delay orders is now beginning to weigh on deliveries, i.e., on the sales figures. Neither Boeing nor McDonnell Douglas have suffered bad results; quite the contrary.

It seems doubtful whether this will be the case with Airbus. It is well known that the consortium does not publish any detailed financial data, but there are various indications that the European aircraft manufacturer is heading for a disastrous year. Regarding the future, the number of new orders has plummeted. By the end of August barely 22 orders had been received, compared to 136 received for 1992 as a whole. Airbus's competitor, Boeing, received 139 new orders during the same period, compared with 243 for the whole of 1992. So the decline at Airbus is far more dramatic.

Deliveries too are limping along. By the end of August 86 aircraft had been delivered (compared with Boeing's 253), whereas 157 were delivered during the whole of 1992 (as against Boeing's 446). This is not so much the result of a steadily dwindling number of orders since 1990, but rather a consequence of the growing number of cancellations and requests to delay deliveries. The most notable of these were the cancellation of orders for 74 aircraft by Northwest Airlines in December 1992, and 85 units by GPA last month. The partial upshot of this is that, at the end of June, Airbus's net tally of aircraft sold since the company started trading was 1,808, just three more than at the end of 1992. Meanwhile, Boeing's sales rose from 8,622 to 8,680.

This is bad news for the four partners in the Airbus Industrie consortium, none of whom are, incidentally, in the best of financial health. Aerospatiale (which holds 36 percent of the consortium's capital) has just announced losses of Fr870 million during the first half of 1993, nearly double its losses over the same period in 1992. British Aerospace (20 percent shareholding) was able to announce slender profits of 20 million pounds, but is still making no profit out of its Airbus activities—especially given the fact that the profit of 800 million Deutsche marks made by parent company Daimler-Benz was converted into a loss amounting to 3 billion marks after adjustment to U.S. accounting regulations. Daimler-Benz had to make this adjustment in order to qualify for being quoted on the New York stock exchange. Belgian manufacturers, such as Sabca, Sonaca, and especially Asco, will face serious difficulties in the coming years, since a large proportion of their sales come from deliveries made to Airbus.

### Germany: Jenoptik Carl Zeiss' Post-Unification Competitive Strategy

94WS0003C Paris EURODIAGNOSTIC in English  
Jun/Jul 93 pp 49-50

[Article by Laurent Leblond: "Reunification Has Forced the German Government to Step In"]

[Text] The atmosphere is tense at the headquarters of the former East German Jenoptik Carl Zeiss complex in Jena. This was the jewel in East Germany's industrial crown. Until 1989 the group was famous throughout the world and supplied the countries of Eastern Europe with precision instruments, microscopes, electronic circuits and integrated circuits for computers. The complex boasted a staff of 70,000 throughout the German Democratic Republic with some 30,000 in Jena.

In 1990 it became Jenoptik Carl Zeiss Jena GmbH, in other words, a limited company and the following year had a turnover of 200 million marks while experiencing some of the hardest times it had ever known. They began with a nonsense introduction of market economy practices and a slump in orders from countries of the former Comecon. Things were worsened by the renewal of a legal battle that had been simmering between the Eastern and Western founders of Carl Zeiss since 1946 when the latter was established in Oberkochen. In January 1991 Lothar Spath, former president of the Bade-Wurtemberg Land was named by the Thuringia Land to advise it on the merger of the two foundations and companies. The West German Carl Zeiss, based in Oberkochen and the Schott Glaswerk in Mainz am Rhein, with a total staff of 31,000, clocked up a turnover of 4.6 billion marks in 1991. Since they manufactured products which were more often than not very similar to those being produced by Jenoptik Carl Zeiss in Jena, but at vastly lower cost, the Oberkochen bosses decided they should buy up their Eastern cousins at a cheap price. They intended to keep on only 5,000 of the 30,000 employees in Jena. Consequently, in February 1991, a large number of those employed at Jenoptik Carl Zeiss held a demonstration in Jena, forcing the local authorities to intervene in the dispute. Shortly after this, Thuringia Land became the sole owner of the group and won a guarantee from the management that it would preserve 10,200 jobs.

Lothar Spath, who has been president of Jenoptik since April 1991 has adopted a dynamic and aggressive strategy to try and save the company. As he says with conviction "the future of Jena lies in science, service and trade." His aim has been to concentrate the firm's activities on state-of-the-art techniques such as medical lasers, microprocessors and precision mechanics. Convinced that "we are now living in the era of the industrial insect" he has streamlined the group by creating 100 small, autonomous private companies which specialise in high performance technology. Furthermore, "the man from the West," as he is known there, has diversified Jenoptik's activities by setting up a real estate development group within the company. The demolition of the main factory of the former Jenoptik Carl Zeiss complex in the very heart of Jena was perhaps the last straw for some and infuriated many former employees of the one-hundred-year-old company. "I've been working here for more than 20 years and now there's nothing left of the tower," sobbed one man in his fifties. The real estate company then proceeded to sell the

land to private investors who built an office block on the site. All the offices have now been rented. It is thanks to bold initiatives such as these that the unemployment rate is much lower in Thuringia (presently 25 percent), than in the other five Lander of Eastern Germany. There, if one takes into account the 22 percent who have only part-time employment or are on vocational training courses, the unemployment rate stands at 40 percent. As Lothar Spath adds "in three years, and with only one-third of the productivity of Western Germany, work will be as costly in the East as in the West and we do not have a precedent which we can use to solve this kind of problem."

But it is going to take more to discourage this fighter. Thanks to his numerous contacts he has already attracted many companies to Thuringia, most of them West German. He is also proud to point out that 30 percent of them come from Bade-Wurtemberg. Spath travels the world promoting and selling Jenoptik's products. He has already closed successful deals in California and Brazil.

Nevertheless times are still very hard in the former GDR and the strike launched on 3 May by steel workers in Saxony and in Mecklenburg is indicative of this. Because of the considerable slowdown in the European economy, management has refused to abide by a 1991 agreement which stipulated a 26-percent rise in wages this year. Strikes were forbidden under the Nazi and hard-line communist regimes: this is the first strike in these regions for sixty years.

Unlike other countries of Eastern Europe such as the Czech Republic or Poland where the transition to a market economy has been less brutal, the former GDR experienced a very rapid period of adaptation following the collapse of the communist regime.

But what can be done to improve the situation? Bernhard Vogel, president of Thuringia Land and a member of the Christian Democratic party like Lothar Spath, does not believe that those famous "market forces" so often invoked in Bonn can solve all the problems. "Priority must be given to the East of Germany, rather than the West. Take the example of Bosch, which has decided to invest in Eisenach." Vogel, a close friend of Chancellor Kohl, has no hesitation in adding "in reality Jenoptik, which belongs to Thuringia, is a state company and we are implementing industrial policy."

Surprising words from a director born in West Germany. Especially given the generally very harsh criticism of government intervention in the economy to be heard at numerous Franco-German meetings. But actions speak louder than words. In the western Lander the federal government has been subsidising agriculture, shipyards and the mining and steel industries for years and without any qualms. The social market economy embraced by Hitler is in fact very different from the ultra-liberalist America to be found in Britain and the United States. The former is far more concerned with the over-all social consequences of decisions taken within the economic sector.

Is a businessman who has a European point of view and invests in the East credible? The case of Jenoptik Carl Zeiss has laid this thorny issue on the line in Germany today. It appears that what is now the European country with the highest population and the biggest land mass in the community is still suffering from some reunification pains. Although Jenoptik Carl Zeiss had a reputation as the official



supplier to all of the Eastern European countries, does that justify its present anti-European attitude?

### EC Countries Unable to Keep Pace With Patent Applications

#### Growing Stronger Through Hardship

93WS0704a BERLIN INGENIEUR DIGEST  
in German Aug 93 p 8-9

[Article by Hans-Peter Canibol "Growing Stronger Through Hardship" first paragraph is BERLIN INGENIEUR DIGEST introduction]

[TEXT] The number of economically significant patents being registered in the world today is on the increase, jumping from 67,703 in 1980 to 90,041 in 1990. But Europeans are falling behind in the race for new inventions.

As late as the early 1970's, the Old World, as far as the inventiveness of its researchers and developers was concerned, was still doing fine. More than 46 percent of the world's inventions were being made by Europeans. By 1990, however, this figure had dropped to just 34.5 percent.

Even Germany, although still the leader among the Europeans, saw its world share of inventions drop from 21.4 to 16.2 percent. According to the Institute for Economic Research (IFO) in Munich, the number of German inventions increased by only 2 percent over the last ten years. One notable exception to this trend is Siemens. In the IFO listing of the economically significant inventions registered in at least two countries during 1989 and 1990, Siemens ranked first, followed closely by Mitsubishi and IBM.

The IFO institute also compiled a list of the five companies that registered the most patents in various individual branches of industry during 1989 and 1990. In the field of electronics, Mitsubishi was first, with 1,602 patents, followed by Toshiba, with 1,578, Siemens, with 1,484, IBM, with 1,401, and Hitachi, with 1,067. In computers, IBM was the leader, with 1,203 patents, followed by Canon, with 1,101, Toshiba, with 416, Fujitsu, with 402, and Hitachi, with 401. Fanuc led the field in equipment patents, with 236, followed by Mitsubishi Electric, with 194, Bosch, with 169, Rieter, with 163, and Siemens, with 126. In the metallurgical field, Sumitomo Electric was first, with 156 patents, followed by General Electric, with 100, Nippon Steel, with 99, Nippon Kokan, with 84, and Alcan, with 66. Bosch was first in automotive technology, with 793 patents, followed by Nissan Motor, with 441, Mazda Motor, with 377, Mitsubishi Electric, with 290, and Daimler Benz, with 267. General Electric was the leader in aviation and aerospace, with 197 patents, followed by Hughes Aircraft, with 155, Aerospatiale, with 101, United Technologies, with 89, and Thomson, with 70. Bayer registered the most chemical patents, with 1,017, followed by BASF, with 953, Hoechst, with 828, Du Pont, with 765, and Ciba Geigy, with 658. Exxon led the field in petroleum processing, with 233 patents, followed by Shell, with 216, Mobil Oil, with 196, BASF, with 180, and Hoechst, with 164. In the pharmaceutical field, Merck was first, with 343, followed by Ciba Geigy, with 318, Bayer, with 306, Hoechst, with 304, and BASF, with 268. Bridgestone registered the most rubber and plastic patents, with 151, followed

by Sumitomo Rubber, with 148, Goodyear, with 104, Yokohama Rubber, with 51, and Bayer, with 34. In the photography and film industry, Fuji Photo led the way, with 756 patents, followed by Eastman Kodak, with 553, Canon, with 500, Xerox, with 406, and Konishiroku Photo, with 389. Finally, in the area of foodstuffs and luxuries, Unilever was first, with 267 patents, followed by Procter & Gamble, with 162, Henkel, with 81, Nestle, with 73, and Colgate Palmolive, with 46.

Konrad Faust, project leader of the study "Actors in Technological Competition," believes that he has identified the reason behind the stagnation of ideas in Germany.

- **Structural Problems:** Germans are good in areas where little is happening. Germany leads the world in the field of mechanical engineering, for example, but research in this field is conducted in a rather leisurely fashion. In dynamic fields such as computer science, Germans lag behind.
- **Skepticism:** Germans have "serious misgivings about new technologies." Of what value is outstanding basic research if technologies such as genetic engineering cannot be utilized in Germany?
- **Lack of Organization:** Once a German goes into research, he is likely to remain there for the rest of his life. This leads to extreme specialization and a high level of know-how. In Japan, on the other hand, university graduates spend ten years in research, then switch to marketing or production—ideally with an original idea for a new product, which they then implement themselves. Consequently, there is greater flexibility within production, spare research capacity, and an openness to new ideas. Faust maintains that this leads "to more flops, but, as a result, to more successes as well."

The dilemma of the Germans is essentially that of the Europeans. The prosperous West, with its bureaucratized scientists and researchers, must develop a method for keeping in touch with dynamic technological fields. It must also choose between the Japanese and the American approach.

For it is not just the Japanese—whose world share of inventions rose from 10.1 percent in 1971 to 24.8 percent in 1990—who are leaving the Europeans behind. The United States has also shaken off its lethargy and reclaimed its position as technological leader, with 30.6 percent of the world's inventions. Faust claims that the market economy is the driving force behind applications-oriented research. In his opinion, the primary cause of the temporary stagnation was the orientation of research on space and armaments. Following the cutbacks in funding, researchers turned their attention to marketable fields.

Europe is not out of it yet. Europeans still make 44 percent of all inventions in the field of mechanical engineering. But that may not last. Miniaturization and electronification is increasingly the norm. Heinz-Dieter Meyer, of Hayek Engineering, is afraid that the older mechanical engineers "are still too mechanically oriented to keep up."

Furthermore, the important innovations in mechanical engineering are being made in Japan and the United States. Just under 80 percent of all the patents registered in the field of

computer technology and 60 percent of the patents registered in electronics are developed by Americans and Japanese. As a result, according to Max Syrbe, President of the Fraunhofer Society, Europeans lack the necessary know-how in key technologies.

European industries are making cutbacks in precisely the wrong areas. From 1989 to 1991, the German national product rose by 25 percent. Spending for research and development (R&D) rose during this period by only eight percent. At the same time, according to estimates by the Federal Research Ministry (BMFT), the number of R&D personnel in the old laender fell 5.8 percent. This has since been eclipsed by the general collapse of eastern German industrial research, which could have provided additional R&D resources. Among the most miserly enterprises were German electronics firms, who, according to the BMFT, cut research spending by 4.8 percent over two years despite the booming economy.

"The state," complains Professor Hartmut Weule of Daimler Benz AG, "must create a powerful infrastructure and an environment that encourages innovation." However, the state has always been most successful when it has been harsh. "Germans lead the world in environmental research," declares Harriolf Grupp, technology expert with the Fraunhofer Institute for Systems Engineering and Innovation Research in Karlsruhe. The reason behind this success? The harshest environmental conditions in the world galvanized German researchers and businesses.

#### **Forget About Major Discoveries**

93WS0704b BERLIN INGENIEUR DIGEST  
in German Aug 93 p 10-11

[Article by Ines Bronowski: "Forget About Major Discoveries" first paragraph is BERLIN INGENIEUR DIGEST introduction]

[TEXT] Siemens leads the world in inventions. While Germany as a whole continues to lose ground to the Japanese and the Americans, the Munich-based concern has left even Mitsubishi and IBM far behind.

This success brings to mind the years when engineering students dreamed of being chosen to work in the Siemens research branch. However, the praise by the Munich-based Institute for Economic Research (IFO) has not gone to the heads of those working in the Siemens central research division. "It is not the number of discoveries, but their market relevance and usefulness to the customer that serve as the standards for our research and development (R&D) work," says Dr. Hans Guenter Danielmeyer of the Siemens board of management. The chief of the Research and Development Division (ZFE) of Germany's largest electronics firm is nonetheless proud of this accomplishment: "Inventions are, of course, an important indicator of the innovative ability of a company."

Danielmeyer attributes the climb by Siemens from number two to number one in the IFO patent ranking to the Siemens R&D system. He defines the importance of patent registration to corporate strategy as follows: "In those areas where we have decided to be strong, we must protect our technologies and undertakings, both nationally and internationally." In his opinion, modern innovation is characterized not only by

speed, but by the parallelism between R&D, manufacturing, and marketing. Moreover, it is the manufacturing culture itself that Danielmeyer believes to be behind the gap between the Germans and the Japanese. "Mastering the technology while maintaining a balance between quality and mass production is the hallmark of an innovator."

This corresponds exactly with the road chosen for Siemens by Heinrich von Pierer, its chairman of the board: "We must increase our profitability; that is more important than growth at any cost." Pierer considers the development of innovative products to be "of utmost importance."

Such products should ensure that profits will continue to grow despite the recession. A 14 percent decline in domestic orders this fiscal year (foreign orders rose by one percent) notwithstanding, the economic crisis has yet to seriously harm Siemens. One reason for this has been the rigorous program of reduced costs and increased productivity ordered by Pierer. By September, 16,000 positions are to be eliminated, and Pierer has announced that "a considerable number" will be eliminated next year as well. He also intends to save 100 million German marks [DM] by reducing management and administrative costs.

However, it is product innovations that the firm is counting on to keep its profits flowing. In Siemens, innovations are the responsibility of the individual branches. It is to these branches that the majority of the R&D funds allocated by Siemens for the year will go. Of the 8.4 billion marks spent by Siemens on R&D in fiscal year 1991/92, 93 percent went into product development, systems engineering, and manufacturing development. According to a study of 1991/92 market reports, Siemens spent more on R&D (DM8.4 billion, or 10.7 percent of its returns) than any other electronics firm. It was followed by IBM (DM8.3, or 7.7 percent), GE (DM6.7, or 9.4 percent), Hitachi (DM6.4, or 6.7 percent), Matsushita (DM5.6, or 5.2 percent), Fujitsu (DM4.8, or 11.4 percent), Alcatel-Alsthom (DM4.3, or 9.2 percent), Toshiba (DM3.9, or 6.7 percent), ABB (DM3.9, or 8.1 percent), and Philips (DM3.3, or 6.7 percent). Danielmeyer allocated five percent of the R&D funds to ZFE, the Siemens think-tank for innovative research.

Of the 48,000 R&D personnel worldwide, Siemens employs a modest 1,500. But they are focused on the 30 so-called core technological fields in which Siemens is active. These interlinked technologies center around six areas of interest: materials and recycling, processes and energy, components and modules, microelectronics, software and engineering, and systems and networks.

Danielmeyer believes that there is no more effectively structured research department anywhere in the world. "We have people responsible for core technologies, whose job it is to see to it that international research developments are recognized and implemented in a timely manner. They act as our eyes and ears to the outside world."

In addition, each Siemens department and enterprise includes an individual responsible for knowing its individual R&D requirements inside out and satisfying them. "In this manner, we have constructed horizontal and vertical lines of communication without personnel and hierarchies," says Danielmeyer, "that enable us to exchange ideas across marketing and technological lines."

"We have to step on each other's toes," explains Peter Kleinschmidt in explanation of this indispensable give and take. Kleinschmidt is responsible for the field of man-machine interfaces. In the laboratories and at the computers surrounding his desk in the ZFE there are only young people. "After 35, they very rarely get any more bright ideas. After that, they are finished here." The ex-researchers can then transfer into product development or manufacturing, where they can implement their ideas and turn them into innovations used to conquer new markets.

Kleinschmidt learned early in his career that it not brand new products, but rapid, practical, qualitative improvements in existing products that are becoming increasingly important for market advantage and increased sales. He remembers his experience as a young researcher in the Siemens/Bosch home appliance development department. Full of enthusiasm with a new defrost sensor, he had to tell himself: "Forget about major discoveries, come up with a way to make production 20 percent cheaper."

### EAST-WEST RELATIONS

#### French Agency To Promote Electronics Exchanges with CIS

BR0410122493 Paris *ELECTRONIQUE INTERNATIONAL* HEBDO in French 2 Sep 93 p 11

[Article by Didier Girault: "CIS: The New Electronics Eldorado?"]

[Text] Francis Carassic, former director of Mentor Graphics France, has set up Vostorg, an organization which represents the biggest electronics manufacturer of the CIS countries. He is investing all his energy in helping French and CIS electronics companies to get to know each other better.

"Working closely with the Paris Chamber of Commerce, Vostorg is in the process of organizing a microelectronics trade fair in Paris next October. It is hoped that the fair will enable French engineers to exchange ideas with their Russian counterparts," explains Francis Carassic, founder and president of Vostorg, a company whose role is to improve communications between France and the CIS countries. This event should complement a seminar on Belarus that the Paris Chamber of Commerce is also organizing in October. With a population of 25 million, the Belarussian region has inherited vast industrial complexes that formerly supplied the ex-Soviet Union with televisions and other electrical household appliances. Too large for the smaller-size potential Belarussian market, these production units are now targeting the export market. India, for example, buys Belarussian televisions produced by Integral, a specialist in electronics and microelectronics (Integral manufacture Horizon and Thomson televisions). Integral, which is represented in France by Vostorg, employs 30,000 to 40,000 people.

#### How To Do Business With the Ex-Soviet Union?

In the field of semiconductors alone, a sector in which Integral accounted for 25 percent of the total Soviet Union production, the CIS countries have five to six manufacturing sites at their disposal. But these are threatened by

degradation following the breakdown of Communism in Eastern Europe. Even if COCOM is permitting the transfer of leading-edge technologies today, (such as SUN's SPARC [scalable processor architecture] technology), the production sites themselves are no longer benefiting from the huge budgets formerly supplied by the military.

According to Francis Carassic, the best way for a French company to successfully penetrate the former Soviet market is, first, to attend CIS trade fairs in their field of interest. There is, however, one problem: Despite the advantageous rates offered to Russian companies, they are not all able to take

### EUROPE-ASIA RELATIONS

#### Belgium: Company Gets Major Japanese Order for Reactor Equipment

BR0810145593 Antwerp *DE FINANCIËLE-EKONOMISCHE TIJD* in Dutch 6 Oct 93 p 10

[Unattributed article: "Coek Engineering Awarded Major Japanese Order—Company Focusing on Far East"]

[Text] The Coek Engineering company has scooped an order for the supply of titanium reactor equipment for the chemical industry to the Japanese contractor General Contractor Chlyoda. The contract is worth some 200 million francs [BFR]. According to company spokesmen, it is the company's first direct delivery to the Far East, a market on which Coek Engineering has been focusing increasingly since the current year.

Coek Engineering is a family business, specialized in the engineering and manufacturing of technical processing equipment for the petrochemical, nuclear, and food industries. The company owes much of its reputation to the manufacturing of titanium equipment for so-called PTA units. These are used for the production of the very corrosive base material for polyesters. Three years ago, Coek Engineering built the biggest PTA reactor ever for Amoco Chemical in Geel; it has a capacity of 250,000 metric tons a year.

The Japanese order for General Contractor Chlyoda includes the construction of three such PTA reactors, having a capacity of 350,000 metric tons a year. The deal with the Japanese contractor had been under negotiation since 1990. It is the company's first direct delivery to the Far East. Earlier this year, orders had been received from China and India, but for those orders, Coek Engineering acted as a subcontractor.

Last year, Coek Engineering achieved a turnover of BFR600 million, some 70 percent of which was achieved in Europe. This year, Coek Engineering hopes to maintain turnover on the same level, thanks to the Japanese order. Spokesmen emphasized, however, that the market for mechanical engineering, especially in Europe, is very weak. According to Manager Laermans, it is indispensable for a company such as Coek to focus on foreign markets in order to survive. He believes that there are still opportunities, especially in the Far East. That is why Coek Engineering has been focusing entirely on exports since the current year. Unlike last year, the company hopes to achieve 70 to 80 percent of its turnover outside the EC this year.

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